PROCEEDINGS OF

THE LINNEAN SOCIETY OF LONDON

156th Session (1943–4) Part 1

PROCEEDINGS OF THE GENERAL MEETING
10 October 1943

held jointly with The Zoological Society of London

Mr. A. D. Cotton, O.B.E., President,
in the Chair.

The Proceedings of the General Meeting held on Thursday, 8 July 1943, having been circulated, were taken as read and confirmed.

The following were thanked for gifts made to the Library since the last meeting :—Mr. I. H. Burkill, The Lady Isabel Browne, Professor G. H. Hale Carpenter, Dr. Eric Hultén, Mr. Sten Kreüger, Major Albert Pam, Mr. J. M. Rowson, Mr. S. Savage, Mr. A. E. Wade, Professor F. E. Weiss, Dr. E. B. Worthington, Bradford Natural History and Microscopical Society, Carnegie Institution of Washington and Uppsala Universitets Växtbiologiska Institution.

The following Fellows signed the Obligation in the Book of the Charter and Bye-Laws and were admitted :—Alec Lindsay Poole and Leon R. Hayward.

The following candidates were balloted for and elected ordinary Associates :—Dr. John Gregory Hawkes and Dr. Chester Jones.

The President reported the deaths of the following members :—Mr. A. C. Gardiner, Fellow and Member of Council ; Dr. Carl Christensen and Professor Einar Lönnberg, Foreign Members ; Dr. Fred Stoker, Rev. Robert Usher, Mr. C. V. B. Marquand, Mr. W. A. Harding, Mr. Colin F. Symington and Mr. Percy Appleyard, Fellows of the Society.

The President announced that, through the death of Mr. A. C. Gardiner, there was a vacancy in the Council.

The President also made the announcement asking for volunteers to help in re-arranging the Society's stock of publications.

The following communications were read and discussed :—

Dr. J. F. G. Wheeler. On a Humpbacked Whale taken in Bermuda in 1942. (Read by Dr. F. C. Fraser on behalf of the author. Discussed by Dr. Malcolm Smith, Dr. G. P. Bidder and Mr. R. H. Burne; Dr. Fraser replied.)

Abstract.—

The circumstances of whale migration and its association with the breeding cycle might lead to races being developed in the north and south Atlantic. The southern stock migrates to the more temperate and tropical parts of the south Atlantic during the southern winter, and the northern stock behaves similarly during the northern winter in the north Atlantic. These migrations coincide with the pairing time, so that the two stocks, in addition to being separated geographically, have also a time discontinuity in their time of oestrus. The effectiveness of these two factors as barriers, preventing the whales in the north and in the south mixing, would of course be dependent on the degree of restriction of the period of oestrus and on the extent to which the animals in each group conform to the general seasonal migration.

Mr. Gilbert J. Arrow. Polymorphism in Giant Beetles. (Discussed by Mr. C. H. Hooper, Dr. L. R. Wheeler, Dr. Malcolm Smith and the President; Mr. Arrow replied. [This will be published by the Zoological Society.]

Dr. V. J. Chapman. 1939 Cambridge University Expedition to Jamaica. Part 1.—A study of the botanical processes concerned in the development of the Jamaican shore-line. Part 2.—A study of the environment of *Avicennia nitida* Jacq. in Jamaica. Part 3.—The morphology of *Avicennia nitida* Jacq. and the function of its pneumatophores. (Discussed by the President.) [These papers will be published in the *Journal*, Botany.]

PROCEEDINGS OF THE GENERAL MEETING

11 November 1943

held jointly with The Zoological Society of London

Mr. A. D. Cotton, O.B.E., President,
in the Chair.

The Proceedings of the General Meeting held on Thursday, 28 October 1943, having been circulated, were taken as read and confirmed.

The following were thanked for gifts made to the Library since the last meeting :—Professor A. J. E. Cave, Professor M. L. Fernald, Mr. F. I. Hillier and Professor F. E. Weiss.

The following Fellow signed the Obligation in the Book of the Charter and Bye-Laws and was admitted :—Miss Julia Hannah Pheasant.

The President reported the death of Mr. W. Percival Westell, F.L.S.

The following communications were read and discussed :—

Dr. L. Harrison Matthews. Parturition in the Kangaroo. (Read by Prof. A. J. E. Cave on behalf of the author. Discussed by Dr. Malcolm A. Smith and Lt.-Col. W. P. C. Tenison ; Prof. Cave replied.)

Abstract.—

The paper records details of the birth of a Grey Kangaroo (*Macropus giganteus*) in the Clifton Zoological Gardens, Bristol, on 16 November 1940, as witnessed by Mr. George Hunt. During parturition the dam assumed a backward-leaning posture, with tail extended forwards and cloaca markedly protruding. The new-born animal crawled from the cloaca and, using its forelimbs only, began an unaided crawl thence to the maternal marsupium, a journey taking some 15 minutes. Maternal assistance was confined to the dam's licking of a moist track of ventral abdominal fur between cloaca and marsupium, along which the offspring crawled.

The details observed at Bristol are corroborative of the scanty records of marsupial parturition available in the literature. A full account of the event will be published in the *Proceedings* of the Zoological Society.

Dr. B. P. Uvarov. Anti-locust campaign in Africa and the Middle East. (Discussed by Dr. Julian Huxley, Dr. Malcolm A. Smith and Lt.-Col. W. P. C. Tenison ; Dr. Uvarov replied.)

Mr. E. H. M. Cox. Papers on the exploration of China : No. 1. The Hon'ble East India Company and China. (Read by the Botanical Secretary on behalf of the author. Discussed by Sir John Pratt, Mr. S. Savage and the President.) [Abstract printed on p. 5.]

PROCEEDINGS OF THE GENERAL MEETING
25 November 1943

held jointly with The Zoological Society of London

Mr. A. D. Cotton, O.B.E., President,
in the Chair.

The Proceedings of the General Meeting held on Thursday, 11 November 1943, having been circulated, were taken as read and confirmed.

The following were thanked for gifts made to the Library since the last meeting :—Professor J. R. Matthews, Professor F. E. Weiss, Dr. C. T. Ingold and The Royal English Forestry Society.

The following Fellow signed the Obligation in the Book of the Charter and Bye-Laws and was admitted :—Dr. Emlyn Glyndwr Davies.

The President reported the death of Sir Edward B. Poulton, F.R.S., F.L.S., and moved the following Resolution, which was passed in silence, all standing :—

> The Fellows of The Linnean Society of London having heard with deep sorrow of the death of Sir EDWARD B. POULTON, F.R.S., desire to place upon record their high appreciation of the services he has rendered to the Society during the fifty-six years of his Fellowship.
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> Elected in 1887, he served on the Council from 1889 to 1917. He was appointed Vice-President on two occasions and held the office of President from 1912 to 1916. Throughout his Fellowship of the Society he showed the greatest interest in its work by frequent attendance at its meetings, by important communications and by acting as the Society's representative at many important meetings both at home and abroad.
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> Deploring the loss of so distinguished a Fellow, the Society desires to express to Mrs. Maxwell Garnett its deep sympathy with her in her bereavement.

After the President had made some introductory remarks, the following communications on 'The Exploration of China' were read. [Printed from p. 8 forward.]

Mr. E. NELMES. No. 2. Robert Fortune, pioneer collector, the centenary of whose departure for China has fallen in this year.

Colonel F. C. STERN, O.B.E., M.C. No. 3. The discoveries of the great French Missionaries in central and western China. (This and Mr. Nelmes' paper were discussed by Col. F. R. S. Balfour, Prof. F. E. Weiss, Mr. J. Insch, Mr. J. R. Sealy and Dr. J. Ramsbottom.)

Dr. MALCOLM A. SMITH. No. 4. Discoveries in Zoology. (Discussed by Mr. Kinnear and Col. F. R. S. Balfour.)

Dr. HUI-LIN LI. No. 5. Botanical exploration in China during the last twenty-five years. (Discussed by Sir John Pratt and Dr. J. Ramsbottom.)

The following exhibits were shown :—

Plants collected by Robert Fortune. [From the Herbarium, Royal Botanic Gardens, Kew.]

Paintings of Chinese plants, by Chinese artists, formerly belonging to John Reeves. [From the Royal Horticultural Society.]

Paintings of Chinese animals, by Chinese artists, formerly belonging to John Reeves. [From the British Museum (Natural History).]

When calling for the first paper on the Agenda, the PRESIDENT said :—

'As announced at the last meeting, the Linnean Society are commemorating the Centenary of Robert Fortune's first expedition to China by devoting this Meeting to a series of papers on the exploration of that country.

'It was recognized in early days that the flora of China was of great interest, and we now know that parts of it are of quite exceptional richness and include a very large number of beautiful species which are suitable for cultivation in this country, either in the open or under glass. In view of the interest of its flora it was not surprising that, after the opening up of China on the conclusion of the war of 1840–2, the Horticultural Society of London should wish to take steps to explore it further. A committee was set up which was termed the "Chinese Committee" and, as a result of its deliberations, within six months of the signing of the Treaty of Nanking Fortune was commissioned to sail to China for the purpose of introducing useful and ornamental plants to British gardens and of obtaining information on Chinese horticulture and agriculture.

'For many years previously the Horticultural Society had been receiving living plants from China, especially from one of their correspondents, John Reeves, an Inspector of the East India Company. The Society had, moreover, acquired through Reeves a very large collection of drawings of Chinese plants prepared by native artists, and we are fortunate in having some of these drawings on view to-day. The five large volumes on the table have been lent to us by the Royal Horticultural Society for this Meeting. There can be little doubt that these beautiful drawings greatly stimulated the Society's interest in the Chinese flora. I have brought up from the Kew Herbarium a selection of Fortune's dried specimens, including the original specimen of the Bohea tea plant. There is a very complete set of his specimens both at Kew and at the British Museum.'

The President then referred to the important part the Linnean Society had played in making the flora of China known to the scientific world, especially by the publication of the great work by Forbes and Hemsley, entitled 'An Enumeration of all the Plants known from China Proper', published between the years 1886 and 1905, and dealing with over 8,000 species.

PAPERS ON THE EXPLORATION OF CHINA.

1 (*in abstract*). THE HON'BLE EAST INDIA COMPANY AND CHINA.

By E. H. M. Cox.

Mr. Cox introduced his subject by indicating the nature of contacts made by adventurous Europeans with the Chinese between A.D. 1516, when the first Portuguese arrived, and A.D. 1635, when the Chinese Emperor Kang Hsi decreed his ports open. Dutch and British had followed the Portuguese to them during this century and a half, but little it was that any of them had learned of China ; and the Portuguese,

whose opportunities were greatest, seem to have introduced to Europe only a single Chinese plant, a superior race of the Sweet orange, which they conveyed to Lisbon, where the original tree is said still to exist.

The Emperor's concession meant little, for all resident Europeans were subject to very stringent restrictions. They had no freedom of movement; they were not allowed to attach any Chinese to themselves as servants other than licensed interpreters and compradores; and they were forbidden to study the Chinese language. The restrictions lasted until after 1840. Yet under them various servants of the East India Company contrived to collect, to a limited extent, dried plants and seeds and to remit them to Britain and, by the services of captains of returning merchantmen, to ship a certain number of the plants of Chinese horticulture locally procurable. The wonder is that they did so much.

Mr. Cox's paper will be published elsewhere. Continuing this abstract of it:—The earliest of the British who interested himself in Chinese plants was the surgeon James Cunningham, who reached China in 1698. He sent dried plants to Plukenet and Petiver and seeds to Sir Hans Sloane; and he made a personal *hortus siccus* which reached the last-named apparently through the offices of a certain Nathaniel Maidstone, who is obscure otherwise. Cunningham obtained the conifer *Cunninghamia sinensis*, *Hibiscus Manihot*, *Rhus semialata*, and the Chinese Tallow-tree, *Stillingia sebifera*, which were raised in Britian from his seeds. He left the East in 1708 or 1709 and apparently died at sea.

Thirty years later Father Pierre Nicholas le Cheron d'Incarville, a French priest and former pupil of the renowned botanist Bernard de Jussieu, went out to China as a missionary, and there he laboured for sixteen years, chiefly in Peking. He sent seeds to Paris and to Philip Miller in Chelsea, thereby introducing, among other plants, *Ailanthus altissima* and *Thuja orientalis*.

Contemporaneously, John Bradby Blake spent seven short years in Canton. He also sent seeds to Britain, and he was instrumental in introducing the Tallow-tree to the West Indies. He died in 1773.

In 1792, and again in 1815, the British Government sent a political mission to China, hoping thereby to obtain better conditions for the merchants. The first mission was under George Macartney, the second, and better equipped, under Lord Amherst. Both were provided with staff for collecting plants and seeds. Politically both were failures; but something of the interior of China was learned by traversing the inland waters to and from the Court, and in the journey the first had to make over the Great Wall to Jehol, where the Emperor happened to be. The staff collected at all opportunities, but misfortune fell on the large supply of seed which the second Embassy had obtained, by shipwreck on the way home. The first mission brought into British gardens *Cupressus funebris*, *Rosa bracteata*, *Macleya cordata* (Bocconia cordata) and *Polygonum chinense*.

Towards the date of the second Embassy, the plant enthusiast had been born. Conspicuous in this class was Sir Joseph Banks, with his garden at Spring Grove, near Isleworth, Middlesex, and, almost as conspicuous, Sir Abraham Hume, of Wormleybury, Hertfordshire. Others were Charles Francis Greville, Thomas Evans, of Stepney, and the brothers Gilbert and John Slater, both Directors of the East India Company.

The Royal Gardens, Kew, took an interest, as the list of Chinese plants in cultivation under Aiton, in his ' Hortus Kewensis ', indicates. To the enthusiasts named above, to Kew, and to others these sent plants and seeds :—William Kerr, resident in Canton and Macao for nine years, with a salary from Kew ; Thomas Beale, a merchant of Canton, and his brother Daniel, resident there for 50 years ; John Livingstone, a surgeon of the Company ; John Reeves, the Company's Inspector of Tea, and his son John Russell Reeves, who likewise was in the Company's service ; and there were others. Moreover, some of the captains of the merchantmen would take a part of their own, procuring conspicuous plants for conveyance to patrons or friends. John Reeves was the most active of the band, very painstaking and very thorough. It is difficult to set out all he did, as so much of it was by way of directing others. He received and looked after the gardeners which the Horticultural Society sent out—John Potts in 1821 and John Damper Parks in 1823.

Kerr was instrumental in introducing *Nandina domestica*, *Lonicera flexuosa*, *Rosa Banksiae*, *Nymphaea pygmaea*, *Lilium tigrinum* and *L. Brownii*. Potts brought home several forms of *Camellia*, two species of *Callicarpa*, and *Ardisia punctata*, but had the misfortune to lose on the voyage 40 forms of *Chrysanthemum*. He obtained also large supplies of seed of *Primula sinensis*. Parks brought home thirty forms of *Chrysanthemum*, *Camellia reticulata*, the yellow-flowered *Rosa Banksiae*, etc.

A power behind these efforts was Joseph Sabine, Secretary of the Horticultural Society from 1810 to 1830 and a devotee of the Chrysanthemum.

There was a subsidiary way of obtaining a knowledge of the flora of China which needs to be mentioned, namely, by procuring illustrations ; and this way was used extensively by Reeves, who employed several Chinese artists in his own house and under his direct supervision. Some of the illustrations so procured will be shown at the next Meeting.

Discussion.—

Sir JOHN PRATT. I am not qualified to join in the discussion of Mr. Cox's extremely interesting paper on its botanical side, but there are one or two observations I should like to make regarding the commercial activities of the East India Company in the pre-Treaty days at Canton. Most of the books dealing with this subject tend to lay too much emphasis on the position arising out of the peculiar conditions inspired by China on the foreign trade at Canton. Not sufficient attention is paid to the extraordinarily pleasant personal and business relations between Chinese and British merchants. They were relations of mutual regard and friendship and of complete trust in each other's honour. Transactions of enormous value were put through without a word in writing on either side. In no other country in the world would such a state of things have been possible. It is true that the British merchants in Canton reacted perhaps a little truculently to the peculiar restrictions imposed on them. Perhaps it is one of our national characteristics to react in that way. These restrictions provided the easiest method by which the Chinese Government could obtain a revenue from the trade. It should be remembered that, in spite of all complaints about the

irksome nature of these restrictions, large fortunes were made by the merchants on both sides, and a very valuable trade grew up. Some idea of the value of the China trade, and its importance to the English budget, may be gathered from the fact that at the beginning of the 19th century the duties on tea imported from Canton provided about one-tenth of the total revenue of this country.

Mr. S. SAVAGE stated that some unpublished documents relating to John Bradby Blake were to be found in the MSS. of John Ellis, F.R.S. (? 1705–1776). These include six letters to Ellis, dated 12 February 1770, Canton ; 2 December 1771 ; 15 January 1772 ; and three undated ones. Four of these letters contain lists of seeds sent to Ellis ; and discuss *Gardenia*, the true Cinnamon and tea. A long obituary notice of Blake appeared in ' The Morning Post and Daily Advertiser ' of 24 May 1774. A letter, dated 16 September 1768, from J. Hyde to Ellis, gives the information that Blake's father, ' Capt. Blake ', had been in China and had brought back many Chinese plant paintings. Ellis had another friend in the H.E.I. Company's service, ' Mr. T. Fitzhugh, one of the principal [*sic*] of the East India Company's factors in China ' (letter from Ellis to Dr. John Hope, 26 July 1768). About this date, Fitzhugh sent Ellis the evidence which enabled him to convince Linnaeus that the plants producing Green Tea and Bohea Tea were of the same species. At an earlier date, 12 December 1760, Ellis had received from Fitzhugh a number of tea seeds preserved in wax, ' from Ningpo in China Lat^{d} near 30 deg^{s} N.' A note shows how Ellis distributed these balls of seed : ' five balls given to Benjamin Franklin ; eight balls sent to various persons in the American Colonies—Dr. Garden, Governor Arthur Dodds, John Clayton, John Bartram, etc.' ; one ball ' delivered to Mr. Solander for Dr. Linnaeus '. Against those sent to America is a note, ' The pacquet with these was taken by the French ' [French partly erased].

The PRESIDENT pointed out that the statement made by Koch in his ' Dendrologie ' (ii, p. 307), and repeated by Bretschneider (Early Eur. Res. Fl. China, p. 124, and Hist. Eur. Bot. Disc., p. 51), that d'Incarville had left a collection of 4,010 Chinese drawings of plants and animals which was preserved in the Paris Museum, had been shown by Fournier (Voy. Sci. des Missionaires Français, 1932, p. 82), to be an error, and that 4,010 was the number of a lot in the ' Catalogue de la vente de la Bibliothèque de MM. de Jussieu '. The actual number of drawings was 72.

PAPERS ON THE EXPLORATION OF CHINA.

2. ROBERT FORTUNE, PIONEER COLLECTOR, THE CENTENARY OF WHOSE DEPARTURE FOR CHINA HAS FALLEN IN THIS YEAR.

By E. NELMES.

ROBERT FORTUNE was born at Kelloe, in the parish of Edrom, Berwickshire, on 16 September 1813. In the years following his schooldays he received horticultural training in gardens at Kelloe and near Edinburgh,

and this tuition in his chosen profession was admirably completed under the famous elder McNab in the Botanic Garden at Edinburgh. Fortune must have been a young man of unusual ability, for in 1842, after a stay of only two and a half years at Edinburgh, he moved south to take up a responsible post in the hot-house department of the Horticultural Society at Chiswick.

This Society commissioned him, in February 1843, to go to China to obtain living plants for them ; and when it is remembered that the Chinese Empire had hitherto been closed to all foreigners except a few specially privileged ones, and that Britain had but recently been at war with China, it will be realized upon what an adventurous task he had embarked. Nineteen years were to elapse before he finally completed his journeys to the East. Four times he went out there during that period (the two middle journeys being undertaken on behalf of the East India Company), spending most of his time in China, but finding opportunities to take a look at Formosa, Java, and the Philippines, and devoting his last expedition (a private one) mainly to Japan.

Although Fortune, in four books on his travels, frequently refers to his botanical researches and calls himself a botanical collector, he was primarily a collector of living plants and seeds for English gardens, and that he was eminently successful in this field is well shown by Mr. E. H. M. Cox in his recent and most interesting account in the ' Journal of the Royal Horticultural Society ' (June 1943). The getting of the finest plants alive to England was always uppermost in Fortune's mind. This is particularly true of his first visit to the East, and of the last, when the famous nurserymen Standish and Noble appear to have been the chief recipients of his floral discoveries. His books are sprinkled with enthusiastic comments and vivid descriptions of the plants which he judged worthy of living transmission to England, but there is scarcely a word about the preparation of botanical specimens.

In spite of this concentration on procuring living plants of horticultural value, Fortune made a considerable contribution to knowledge of Chinese botany, partly through the plants he dried and partly through those he sent home alive, for many of the latter, when they flowered, were found to be new, and were described by Lindley and others in various periodical publications, such as the ' Gardeners' Chronicle ', ' Botanical Register ', and the Horticultural Society's ' Journal '. Most of Fortune's herbarium specimens were prepared during his first visit to China, and these, according to Bretschneider, comprised about 450 species [? numbers], of which about 25 were new to science. Bretschneider adds that this collection ' was distributed, in 1847, to the great botanical institutions in Europe and to several distinguished botanists of various countries '. The number of novelties was considerably increased from among the living collections. About 300 of his species are cited in Forbes and Hemsley's ' Index Florae Sinensis ', nearly 100 being given as from ' Fokien : Amoy ', and over half of the remainder as from ' China, without locality '. The others bear on their labels such place names as Chusan, Chekiang, Chinchew, Ningpo, and Shanghai.

Fortune's first and most lengthy stay in China is described in his book,

'Three Years' Wanderings in the Northern Provinces of China', which was published in 1847. These provinces are not actually northern China, but are northern in relation to Canton, Macao and Hong Kong, the only parts of China at all familiar to Englishmen up to Fortune's day.

He arrived at Hong Kong in July 1843, sailed up the coast of China in the late summer and autumn of 1843, and again in the spring and summer of 1844 and 1845, collected chiefly at Amoy, Chusan, Ningpo and Shanghai, and returned each winter to Hong Kong to despatch his plants to England in the little greenhouses called Wardian cases. The chief object of the third trip to the north, he wrote, was 'to make a complete collection of all my finest plants, for the purpose of taking them home under my own care'. He got back to London in May 1846.

His first glimpse of China disappointed him. Viewed from the sea, its hills appeared to be almost devoid of vegetation,' with rocks of granite and red clay showing all over their surface. Was this, then, the "flowery land", the land of camellias, azaleas, and roses, of which I had heard so much in England? What a contrast betwixt this scenery and the hills and valleys of Java, where I had been only a few days before!' Fortune was, however, soon compensated at Hong Kong, with its grand rugged scenery and its interesting flora. He notes as a curious fact that all its most ornamental plants, including the most beautiful of the orchids, are found 'high up on the mountains'; whereas in the northern parts of China, he adds, such as Chusan and Ningpo, similar plants occur at lower levels, with 'little else than species of grass, wild roses and violets' on the hilltops. One detects here Fortune's lack of interest in those wild plants which were not considered worthy of inclusion in the gardens of the period. *Chirita sinensis*, found in ravines 'under the ever-dripping rocks', was among the first plants to be sent home, and its description, by Lindley, appeared in the 'Botanical Register' in 1844. At 2,000 feet Fortune discovered *Torenia concolor* Lindl., also described and figured in the 'Botanical Register', in 1846. He left the island in August 1843 for Amoy.

As Fortune does not appear to have tarried at Amoy in 1844 and 1845, when he revisited other places on the coast, he presumably collected most of his specimens there on his first visit. One of these is the rare rosaceous plant *Photinia Fortuneana* Maxim., which was not described till 1873. At Amoy, also, Fortune secured *Viburnum Hanceanum* Maxim., and he was apparently the first to collect it in China, as Sampson did not get it till 1870, and then at Canton; *Lonicera Maackii* Maxim., found twelve years afterwards on the Amur River; *Halesia Fortunei* Hemsl.; *Styrax Fortunei* Hance (reduced to *S. serrulatum* Roxb. in the 'Index Florae Sinensis'); and *Monochasma Savatieri* Franch. *Saururopsis chinensis* Turcz. was founded as a new genus in 1848, apparently based on *Fortune* 102, from Amoy, but it was reduced later to *Saururus Loureiri* Decne, a plant occurring also in Japan and the Philippines.

Fortune's disinclination to spend his time collecting plants of no horticultural value is shown in that chapter of his book which tells of his ship seeking shelter from storms in Chimoo Bay on the way north from Amoy to Chusan. He sent his servant on shore, first pointing out

o him which direction towards the interior he was to take, and requesting im to collect all the plants he could find. Next morning Fortune iscovered that the man had stayed near the shore and had only a ' few seless things ', because, as he said, if he had ventured inland he would ave been beaten and robbed by the Chinchew men. Fortune did not elieve this, thinking the man lazy, and set out with him on the following ay to give him a long walk and teach him a lesson. But the fears of he servant were well founded. The two men were set upon by roughs, osing their valuables and nearly their lives. It is only because of this ttack apparently that Fortune mentions any of the plants collected n this locality. ' Amongst the plants ', he says, ' which were nearly estroyed in the fight between my servant and the natives were several ne roots of *Campanula grandiflora*, which grows wild amongst these ills, and a new species of *Abelia* (*Abelia rupestris*) '. This incident erves to explain why Fortune's activities were confined mainly to the oastal districts. It was extremely dangerous at that period to attempt uch penetration into the interior of China, and it would have been olish to put the success of his eastern journey to such hazard. Fortune as a man of great determination, and it was difficult to dissuade him om a course of action, or to make him turn back from an expedition n which he had set his heart, however dangerous it was said to be : but evertheless his determined character had a wise blend of prudence. The procedure of sending Chinese inland to collect plants, as suggested y the Horticultural Society, does not appear to have been very successful.

Fortune reached the island of Chusan in October 1843 and was elighted with its rich flora. ' The first glance at the vegetation ', he ays, ' convinced me that this must be the field of my future operations '. Ie likened the island, with its ' succession of hills, valleys, and glens ', o the Highlands of Scotland. Valleys and hills alike were ' rich and eautiful ', covered either with nature's varied vegetation or man's ultivated crops. Besides the usual crops, Fortune mentions a fibre-roducing nettle, *Boehmeria nivea* Gaudich., the oil plant, *Brassica hinensis* Linn., the tallow tree, *Stillingia sebifera* Michx., the camphor ree, *Laurus Camphora* Linn., and the green tea shrub, *Thea viridis* Linn.

In the chapters of his book in which he describes his first visit to Chusan in 1843 and his considerable activities there in 1844, he again nentions few wild plants by name. There were, however, some interesting lants among Fortune's Chusan collections. It was here that he collected *Viburnum macrocephalum* Fortune and first saw *Wistaria chinensis* rowing wild, though it is not surprising that this beautiful plant had een known from Chinese cultivation long before Fortune's day. *Buddleia indleyana* Fortune and *Edgeworthia chrysantha* Lindl. were other of 'ortune's Chusan discoveries. From the hills of Chusan and Ningpo in 844 Fortune sent home seeds and herbarium specimens of a curious enus of Juglandaceae. Lindley described the plant in 1846 as *Fortunea hinensis*, but, unfortunately, it already bore the name *Platycarpa Strobilacea* Sieb. & Zucc.

Fortune went on from Chusan, in the autumn of 1843, to Ningpo, oo late in the season to see much of the native flora, but he found dequate compensation in exploring the gardens of the mandarins.

He returned to Ningpo earlier in the season, both in 1844 and 1845, but appears to have done little botanizing; and it was in the next decade, on further visits to China, that Fortune made his most notable discoveries in this area. He likens both the flora and the agricultural products of Ningpo to those of Chusan and its associated islands, but adds, as a curious fact, that he always found the mainland of China richer in plants and in animals than the islands.

The northern limit of Fortune's first journey to China was Shanghai, and he speaks of it as the ' most northerly of the five ports at which foreigners are now permitted to trade with the Chinese '.

Fortune first arrived at Shanghai at the end of 1843, when, as at Ningpo, the year was too advanced for much plant collecting, and before long he returned to Hong Kong, whence he despatched his 1843 collections to England. He returned to Shanghai in 1844 and 1845 and stayed there for a time during each spring and summer. It was in a Shanghai garden that Fortune found a barberry which he brought back with him alive in 1846, and which Lindley described (in Journ. Hort. Soc.) as *Berberis* [*Mahonia*] *Fortunei*. In like manner Fortune found two other new plants, *Indigofera decora* and *Rosa anemoniflora*.

In the year 1846, having returned to England, Fortune was appointed, on Lindley's recommendation, Curator of the Apothecaries' Garden at Chelsea. He held this post but two years, for he went off again to China in 1848, under the auspices of the East India Company, who commissioned him to introduce Chinese tea plants into their plantations in north-west India. He returned to England in 1851, but was back again in China in 1853 on a similar mission, this time with instructions to take not only further supplies of tea seeds and plants to India but tea-makers as well. Fortune has recorded his experiences on these two expeditions in ' A Journey to the Tea Countries of China ', and ' A Residence among the Chinese . . . during a Third Visit to China from 1853 to 1856 ', published in 1852 and 1857 respectively.

During these two further journeys to the Far East, Fortune, though preoccupied with his special business, maintained his interest in Chinese plants. Three new hollies were among the spoils of these later years: *Ilex cornuta*, *I. leptacantha* and *I. microcarpa*, all described by Lindley. The first was found near Shanghai, the second in the vicinity of Ningpo and the third in ' North China '. His search for tea plants took him inland to the Bohea Mountains, lying on the boundary between Fukien and Kiangsi, where, in 1849, he discovered two new evergreen oaks, *Quercus inversa* and *Q. sclerophylla*, and to other districts at some distance from the coast. He found occasion to revisit the gardens of Shanghai which once more yielded him new and interesting plants.

Most of Fortune's plants resulting from these ' tea journeys ' were sent home to the Bagshot nurserymen Standish and Noble. *Lonicera Standishii* Carrière was probably one of these plants, named, in the words of J. D. Hooker (Bot. Mag., 1868, t. 5709), ' in honour of the active and intelligent nurseryman to whom many of Fortune's rich Chinese collections were consigned '.

One of the most notable of Fortune's discoveries in the eighteen-fifties was *Rhododendron Fortunei* Lindl., which he found at about 3,000 ft. on

nountains to the south-west of Ningpo. ' In a romantic glen ', Fortune elates, ' I came upon a remarkably fine looking rhododendron. A pecies of the genus (*R. Championae*) had been discovered in the Hong Kong hills, but none had previously been met with to the northward, although the azalea is one of the most common plants in the mountains of Chekiang '. A shrub with *Philadelphus*-like flowers, much admired by Fortune on the Ningpo hills, was eventually referred by Lindley to a new genus, as *Exochorda grandiflora* (in Gard. Chron. 1858), after having been previously named by himself *Amelanchier racemosa*, and described and figured (in Bot. Mag.) as *Spiraea grandiflora* Hook. It was on his third journey to China, and apparently at Ningpo, that Fortune discovered the Chinese varnish tree (*Rhus vernicifera* DC.), which he introduced into India at the request of its Agri-Horticultural Society.

Between 1848 and 1856 Fortune discovered several remarkable conifers. Of these, *Juniperus sphaerica* Lindl. was found on hills north-west of Ningpo, and *Cephalotaxus Fortunei* Hook. about 200 miles to the south-west of Shanghai. Near Foochow, in the grounds of a celebrated temple, Fortune came upon a single noble and aged conifer, seeds from which were sent back to Standish. Murray, in his ' Pines and Firs of Japan ', 1863, named the tree *Abies Fortunei*, but Carrière, in the ' Revue Horticole ', proposed for it a new genus, *Keteleeria*. In 1853, in the mountains south-west of Ningpo, Fortune found what was at first thought to be *Larix Kaempferi*, which Kaempfer had discovered in Japan many years before. Eventually it was recognized to be quite distinct, and was described by Mayr as *Pseudolarix Fortunei*. The Abbé David got this species later in Kiangsi.

When Fortune was in the *Pseudolarix* locality he noticed in a garden two young specimens of what appeared to be a new species of yew. The owner told Fortune that the tree grew wild on the mountains ten or fifteen miles away. There he found it, 60–80 feet in height, but not then in fruit. Later he discovered its seeds in the shops of Ningpo, where they were considered of use in cases of asthma. Some of these were sent to Glendinning, of Chiswick, and the result was *Torreya grandis* Fortune.

From these journeys to China, and thence to and from India, Fortune arrived back once more in England in December 1856.

His final expedition to the Far East was due, as he explains in the preface to his last book, ' Yedo and Peking ', 1863, to the fact that the Japanese had just opened their country to foreigners for the first time for over 200 years. Since 1636 only a few Dutch and Chinese had been allowed within the boundaries of the country, and these had been ' kept almost like prisoners at Nagasaki '. It was, therefore, chiefly in Japan that Fortune's last eastern activities lay. His stay there, except for a hurried trip to Shanghai to despatch his Japanese collections to England, as there were no means of sending them direct from Japan, lasted from October 1860 until July 1861, when, profiting from the cessation of recent hostilities, he was able to sail from Shanghai, in 1861, to the new treaty ports of Chefoo, Tientsin, and Peking, leaving China for the last time in November of that year. It goes without saying that Fortune spent most of his last stay in China combing nurseries

and gardens in this new area, in order to transfer the best of their plant to the care of his old friend Standish.

So ended the strenuous and fruitful endeavours of this great plan collector. His lasting love for floral beauty is reflected in the plants he collected, which contained few 'weeds', but a preponderance noted fo the charm of their flowers or foliage.

Fortune's later years were spent in quiet retirement in Scotland He died on 13 April 1880.

Discussion.—

Mr. James Insch. There is much of great interest in the paper to which we have just listened by Mr. Nelmes, and I would like to add a few remarks on the part played by Robert Fortune, who was deputed to collect tea seed in China for the East India Company's plantations in the North-Western Provinces and for other districts in India. This was the second of Fortune's journeys to China, where he arrived in September 1848. To explain the reason for this visit we have to go back to the early thirties, to the acrimonious controversy about the comparative potability values from infusions of tea-plant leaves from China and from Assam which was waged between Wallich and Griffith At that time the commercial relations with China had assumed a character of uncertainty, the only trading port allowed to the British being that of Canton. Although the quantity of tea consumed in the United Kingdom was exceeding 25,000,000 lbs. per annum, tea-growing was then a Chinese monopoly. As a safeguard it was considered desirable to commence cultivation in the territories of the East India Company. G. J. Gordon, of Calcutta, was therefore commissioned in 1834 to secure seed from China, which, on trial, proved to be of inferior varieties. The early attempts by private enterprise to establish estates were failures outlay was extravagant, and it appeared in the early forties as if tea in Assam could not be grown commercially. However, with more efficient management prospects improved. Meanwhile, the plantations in the North-Western Provinces, which remained under the control of the East India Company, made slow but steady headway, realizing satisfactory prices for the small quantities of tea produced. Fortune who had become known to many British readers by the publication of his 'Three Years' Wanderings in the Northern Provinces of China' was given an appointment in 1848 by the East India Company's Directors in London to proceed to China for the purpose of obtaining the finest varieties of the tea plant, as well as native manufacturers and implements for the Government plantations in the Himalayas. Adopting the dress and manners of the Chinese, he succeeded in visiting and collecting seed in the finest green and black tea districts. Tea seed without special packing retaining its vitality for a very short period, the whole of his 1848 consignment perished on the voyage to India. Subsequent lots despatched in Wardian cases met with a better fate. Reaching their destination in good condition, they were distributed to various centres. Fortune himself, accompanied by Chinese tea makers with their implements, arrived in Calcutta on 15 March 1851. Leaving after ten days' stay at the Botanic Gardens, he travelled via Allahabad

nd Saharanpur to the tea plantations in the districts of Garhwal and Kumaon. Inspection of the plantations occupied his time until the end f July, when he left for Calcutta, which he reached on 29 August, visiting Delhi and Agra en route. From the writings of Fortune and of Dr. Jameson, who supervised the plantations for the East India Company, t is obvious that they did not see eye to eye as to how the properties hould be managed.

Of the comments made by Fortune during his tour of the plantations he following are worthy of note :—disapproves of low-lying flat land for ultivation ; objects to the type of irrigation, an excessive amount of vater souring the soil ; recommends a moderately rich, light clayey soil vith an abundant admixture of humus as ideal for growth ; draws attenion to the injurious effects of plucking leaves from very young plants ; dvocates cropping all bushes lightly until the rainy season commences ; mphasizes that the best varieties in the nurseries should be chosen for ransplanting in the fields. To-day, after 100 years' experience, better dvice on most of the points could not be given.

Notwithstanding the avalanche of adverse criticism hurled at the ntroduction of varieties from China to India, there would probably ave been no choice Darjeeling teas produced for the connoisseur without he importation of such seed.

The practice now generally prevailing is to establish in these hills vhich are renowned for yielding exquisite flavour at high altitudes, ardy, smallish-leaved hybrid plants, the progeny of China and Assam arents, the former descendants of stocks collected by Fortune and Jordon.

Russia, in 1928–30, secured for the Georgia estates from the Darjeeling istrict large quantities of seed, the produce of hardy China/Assam ybrids. Many of the Chinese parents had, in all probability, been raised rom stocks brought to India by Fortune.

Mr. J. R. Sealy. It is possible that the statement by Bretschneider p. 421 of his 'European Botanical Discoveries in China') that the ollections of dried plants made by Fortune during his first journey to hina in 1843–5 were distributed by the Horticultural Society in 1847 s not correct as there is evidence that collections were distributed in 845 and 1846 by a Mr. Heward of Young Street, Kensington. There is a ote in Hooker's 'London Journal of Botany', v. p. 11 (1846) that the istribution by Mr. Heward had commenced, whilst the dates of purchase f the set in the British Museum herbarium are given as 1845 and 846 (Hist. Coll. Nat. Hist. Dep. Brit. Mus., p. 88; 1904); in addition, he labels with the set from Bentham's herbarium bear the date 1845 r 1846, and these must presumably be the dates of receipt and not of ollection, since Fortune was not in China in 1846. Further evidence hat plants were distributed prior to 1847 is to be found in Hooker's 'London Journal of Botany', vi, pp. 44–6 (1847), where is printed a etter from Moscow, dated 1 September 1846, which includes a list of eterminations of Fortune's plants, this list having been sent to the vriter of the letter by Zuccarini.

Mr. Heward also distributed the plants collected in Java by Thos. Lobb, nd there is little doubt that he was the Robert Heward who is

included in Britten and Boulger's ' Biographical Index of British and Irish Botanists ', ed. 2, p. 146 (1931), and of whom an obituary notice appeared in the ' Gardeners' Chronicle ', (n. ser. VIII, p. 571 ; 1877).

By the instructions given to Fortune by the Horticultural Society, he was to preserve for the Society a specimen of every plant he collected, but any other collections he made were to be his private property (Cox in Journ. Roy. Hort. Soc., LXVIII, p. 165 ; 1943). There is also a statement in the ' Gardeners' Chronicle ', 1843, p. 140, that in addition to his work for the Horticultural Society, Fortune would also make collections for distribution, and anyone interested was advised to get in touch with Dr. Lindley. The collections distributed by Heward were evidently those made by Fortune for his own profit.

The collection which Fortune made for the Society was sold by them on 29 January 1856, when the Society's herbaria were disposed of by auction, and was one of the items purchased for Delessert and the Muséum d'Histoire Naturelle, Paris (Gard. Chron., 1856, p. 68).

PAPERS ON THE EXPLORATION OF CHINA.

3. THE DISCOVERIES OF THE GREAT FRENCH MISSIONARIES IN CENTRAL AND WESTERN CHINA.

By Col. F. C. STERN, O.B.E., M.C., F.L.S.

THE French missionaries were the first Europeans to discover the rich flora of the mountains of Central and Western China. They sent back to the Museum of Natural History in Paris the dried specimens of the plants they collected, and thereby made this wonderful flora known to European botanists. Of course, collecting of plants was not the first consideration of these missionaries. They had their own special work to do, and their collections consisted mostly of plants they came across in their journeys from one station to another. The early collections were mainly of plants cultivated by the Chinese in their gardens. The Roman Catholic missionaries arrived in China at the end of the 16th century, and the first one to reside in Pekin was Mattaeus Ricci, who lived there in 1600. Most of them, at that time, were more interested in economic plants than in the wild plants.

The first missionary that one hears of who sent home dried specimens of plants was Father Pierre d'Incarville ; he sent dried specimens to the Museum in Paris in 1743. He had been a pupil of the French botanist Bernard de Jussieu, who named the genus *Incarvillea*, after him. Many of his dried specimens were of plants cultivated in the gardens of Pekin, such as *Viburnum fragrans*. These plants were later found wild—*Viburnum fragrans* in 1913 by Purdom and Farrer in Kansu, and *Xanthoceras sorbifolia* by Father David about 1866 in southern Mongolia.

For the hundred years between 1750 and 1850 no French missionaries appear to have been particularly interested in collecting plants. In the first fifty years of the 19th century certain Europeans collected plants while on their journeys, such as Dr. Abel, who accompanied Lord Amherst, the British Ambassador, in 1816, on his journey to Pekin. Potts and Fortune, sent out by the Horticultural Society of London.

concentrated on garden and economic plants. Then from 1850 to the end of the 19th century French missionaries made botanical history by their discoveries in Central and Western China. At that time no one had any idea of the wealth of species awaiting discovery in China. In fact it was not until Adrien Franchet, one of the botanists in the herbarium of the Museum in Paris, became interested in the collections sent back from China that the richness of this Chinese flora began to be known. He began writing about these collections in 1882 and continued to publish papers up to the end of the century. He named many of the species, and there is little doubt that it was through his encouragement that further collections were made.

The first of these missionaries was Father Paul Perny, who lived in the Province of Kweichou, south of Szechuan, between the years 1850 and 1860. He sent to the Museum in Paris many specimens; the best known of his discoveries was the curious and attractive holly *Ilex Pernyi*, but many of his specimens were lost. After him came one of the most famous of all the missionary explorers, Father Armand David. He first went to Pekin, whence he journeyed through the mountains on the west and north-west of that city. His collections were sent to the Museum in Paris, and the authorities there were so impressed by their importance that David's missionary superiors were asked to allow him to go to other parts of China, where he might collect plants. His first big journey was in 1866 and 1867, when he went north-west from Pekin into southern Mongolia. There he found growing wild some of the plants he had seen in the gardens of Pekin, such as the yellow rose, *Rosa xanthina* and *Xanthoceras sorbifolia*; the latter he introduced to cultivation in Europe, and it was figured in 'Flore des Serres' in 1869.

His second great journey lasted for two years, from 1868 to 1870. He went up the Yangtse River by Shasi, Ichang to Chungking, then north to Chengtu, then west to the mountains of the district of Mupin. David was the first to discover the rich flora of this area. The flora of these mountains is so varied and so rich in new species, and even in new genera, that it is impossible to begin to describe them. They include rhododendrons, trees such as maples, and *Prunus*; shrubs such as *Buddleia*, *Stransvaesia* and cotoneasters; herbs such as primulas and gentians and lilies. *Lilium Davidi* and *L. Duchartrei* were two of his discoveries. Here he found the remarkable new tree which was named after him—*Davidia involucrata*. The *Davidia* grows up to 50 feet in height and the flowers proper have two snow-white bracts hanging down on each side, enclosing the flower head. The two bracts are always unequal in size, one usually 6 inches long by 3 inches broad, and the other smaller, $3\frac{1}{2}$ inches by $2\frac{1}{2}$ inches. The tree is very beautiful in bloom; it must be a fine sight to see a number of these trees in flower in nature. This area, first collected in by Father David, contains a rich and varied flora. Strangely enough, it has been neglected by modern collectors, and many of the species found originally by David have never been collected again. Its flora differs much from the flora south of the Yangtse River in Yunnan, owing largely, no doubt, to its drier climate.

Father David returned to Shanghai in 1870 in an exhausted condition, and, after a stay in Europe, started on his third journey in 1872. This

journey lasted four years. Starting from Pekin, he travelled south west through the province of Chihli to Chenting ; across the Yellow River to Honan ; then westward to Sianfu, the capital of the province of Shensi, collecting in all this country, then going on to Hanchung and back by the Han River. He made collections of plants, animals and insects during this journey, finding amongst other plants *Paulownia* and the birch with rose-coloured bark, *Betula utilis* v. *Prattii*. Father David became ill at the end of this journey and returned to France. He had collected on these expeditions some 1,500 species, of which 243 were new to science. When he returned to France he encouraged another priest of his Order, Father Jean Marie Delavay, then on leave in France from China, to continue on his return this work of botanical exploration. Father Delavay had been interested in collecting plants when he had been in Kwangtung Province, but he now undertook to send to the Museum in Paris his botanical specimens. Father Delavay was sent to Talifu in Yunnan. He travelled through the provinces of Hupeh, Szechuan and Yunnan to his destination at Tapintze, north-east of the great Tali Lake. He collected for the next ten years in the mountains of Tali and Likiang. This was a new country from a botanical point of view, and probably the very best floral area in the whole of China ; its mountains proved to have an even richer and more varied flora than those of Mupin. It is a broken country of huge ranges and deep valleys with many of the valleys carrying a flora peculiar to themselves. Again as in Mupin, the flora consists of pines, hardwood trees such as *Magnolia Delavayi* ; shrubs such as *Philadelphus*, *Osmanthus*, and tree paeonies *Paeonia Delavayi* and *P. lutea* ; herbs such as gentians, *Iris*, *Isopyrum* anemones, *Meconopsis*, lilies, and *Incarvillea Delavayi*, a herb which commemorates the names of two great French missionaries. The real wealth of this area is in the primulas and rhododendrons, possibly due to the higher rainfall of this region. It appears also to be the meeting place between the Chinese and Himalayan flora. These valleys and cliffs are the home of many *Primula* species, *P. malacoides* in the valleys and many different species, such as *P. nutans* and *P. sonchifolia*, growing up the mountain sides. Here Father Delavay discovered the genus *Omphalogramma*, a close ally of the primulas. Again the rhododendrons vary from the trees, *R. fictolacteum*, *R. lacteum* and *R. taliense*, which grow in dense thickets up to 40 feet high, to the sweet-smelling *R. bullatum* growing on the rocks, and to the low-growing rhododendrons, such as *R. racemosum*, *R. repens* and *R. intricatum*, which carpet the open spaces on the high uplands. This is only an outline of the plants discovered and collected by Delavay. He collected 32 species of gentians and six new species of lilies and the new genus *Nomocharis*. In all he sent to Paris some 4,000 different species, many of them new to science. In 1888 Delavay contracted plague, but as soon as he recovered he continued to collect, and died in Yunnan in 1895. Delavay prepared his specimens with great care and labelled them all with his own hand. He sent home some 200,000 specimens, which are, or were, in the herbarium in Paris. He also sent home seed of some species which were grown in the garden in Paris and found to be hardy in the European climate.

Botanists and gardeners must always be grateful to Father Delavay, who devoted the spare time of his life to the discovery and collection of so many beautiful and wonderful plants. The area in which Delavay lived and worked was not only rich in species, but it was rich in just those species which were suited to cultivation in European gardens.

Another missionary, Father Jean André Soulié, lived at Tatsienlu, in western Szechuan, in 1889 and sent to the Museum in Paris several hundred species from this area which contained some new species, but many of the plants had been already collected by David. Father Soulié sent to Paris in 1903 seed of *Buddleia Davidi*, which was originally discovered by Father David. Few people realize that this beautiful shrub, so plentiful in every garden, and even a weed now in the chalk cuttings of the Southern Railway, was only introduced to Europe 40 years ago. Tatsienlu is important geographically, as it is the gateway from China to Tibet. Father Soulié in one of his journeys travelled from Tatsienlu to Tseku on the Mekong River through a part of Tibet.

In 1892, Father Paul Farges collected in the mountainous regions in NE. Szechuan, and sent to Paris many hundreds of species. In this area also there is a rich flora of hardwood shrubs, rhododendrons, primulas and lilies. Not a great deal is known of the plants collected by Farges, as modern plant collectors have hardly touched this area, and I think there is still work to be done with many of his specimens in the herbarium in Paris. Dr. Henry had also collected here some four years earlier, but was not able to devote time to the flora as did Father Farges.

The French missionary Fathers and Dr. Augustine Henry, of the Chinese Maritime Customs, were the pioneers who discovered the wonderful flora of the mountains of central and western China and the countless new species that exist there. Owing to their labours and the collections made by them, the later collectors of this century were able to send home a rich harvest of seeds of rhododendrons, trees, shrubs, primulas and lilies. It was Franchet, the botanist in Paris, who first made known the richness of the flora and the treasures that exist in these mountain ranges. This knowledge led to the sending out of the collectors on the part of English horticulturists, Wilson, Forrest and others, and the results of their expeditions far exceeded the most sanguine estimates of botanists or horticulturists. E. H. Wilson first went out in 1900 to collect seed of the plants discovered by Father David and Dr. Henry, and especially to introduce the *Davidia*. Wilson collected the seed in 1903, and from these seed came the Davidias now growing in western gardens.

Wilson collected from 1900 to 1911, covering all the country travelled over by Dr. Henry, from Ichang, western Hupeh, to Chengtu in Szechuan; then followed the route of Father David to the Mupin district; he also collected in the area of Tatsienlu, where Father Soulié had made his collections.

George Forrest and F. Kingdon Ward collected in the area of Tali and Lichiang, which had been made known by the collections of Father Delavay. Forrest made seven expeditions from 1904 to 1932, when he died in harness, collecting at Tengyueh. He collected in the area which

lies between 29° and 24° north latitude, and 98° and 101° east longitude, concentrating on the area where Father Delavay had made his wonderful collections. Kingdon Ward also collected here, but later concentrated on the country to the north and west in eastern Tibet, in northern Burma and Assam. Both Forrest and Kingdon Ward entered this area from Tengyueh in Burma, unlike Father Delavay who came to this area through China.

The above is just a short history of how the wonderful flora of the mountains of China was discovered. Collectors in these great mountains have to endure many dangers and discomforts, and these sturdy missionary Fathers will ever be honoured by botanists and horticulturists alike, and remembered by the many plants that bear their names.

Discussion.—

Col. F. R. S. Balfour. What Colonel Stern has told us of the botanical achievements of French missionaries in China has been of the greatest interest. My own close connection with E. H. Wilson's last expedition to Szechuan in 1910 may be of interest to Fellows. It was in December 1909 that Professor Sargent wrote asking if my friends in this country would be willing to subscribe one-half of the cost of this projected fourth botanical exploration to western China, the Arnold Arboretum bearing the other half. The especial object was the introduction of conifers of which Professor Sargent thought there might be a great many new species, especially of *Picea*. The enterprise was financed without the least difficulty and was eminently successful. Wilson sent back 462 lots of seed under separate numbers, many of them conifers, but also numerous rhododendrons and new species of other genera. The half shares of these seeds were sent to me from the Arnold Arboretum and distributed by myself. With hardly an exception the resulting plants have proved perfectly hardy in this country. Many of them, especially the rhododendrons and conifers, may be seen in our collections today.

Professor F. E. Weiss referred to the interest with which he had listened to Colonel Stern's fascinating account of the introduction of horticultural plants from China. But while we are indebted to so many decorative plants, there are also many plants of economic value we have received from that country. His personal interest centred in the introduction by Augustine Henry of the rubber-containing shrub, *Eucommia ulmoides*, in which the rubber is contained in the form of elastic threads and not in liquid latex. For that reason it cannot be tapped for rubber but the vegetable tissues would have to be got rid of by decay of the leaves and bark, which contain most of the threads. The plant cannot therefore be economically dealt with for its rubber contents.

Prof. Weiss recalled that he had described the development of these threads in his first botanical publication through the Society (Trans. Linn. Soc. Lond., ser. 2, III, pp. 243–54 ; 1892).

PAPERS ON THE EXPLORATION OF CHINA.

4. DISCOVERIES IN ZOOLOGY.

By Malcolm A. Smith.

This is the centenary of a great collector of living plants, and it is fitting, herefore, that most of the papers celebrating the event should be by otanists. But in case some of you should go away with the idea that oologists have not contributed anything to the early exploration of hina, I should like to say a little about them.

As a matter of fact, the zoologists have contributed quite as much as he botanists, and the early travellers, knowing that they were going nto regions that were unknown both zoologically and botanically, ndeavoured to collect material for both branches of science. They ere naturalists in the widest sense of the word.

In the short time at my disposal I am not going to say much about he men themselves and the specimens they collected; that has been ritten about long ago. I should like to discuss chiefly what is ot so well known, namely, the way in which they travelled and the ethods by which they collected. I have been three times into China, wice on collecting expeditions, and I have talked with men who have een much farther into the country than I have. The conditions under hich we travelled there in this century appear to be much the same s when Fortune made his journeys 100 years ago. The cities have hanged, but the country goes on much as it used to. Compared with he adjacent region of Indo-China, China is an easy country to travel in. xcept in the far north and west it is well populated, and there are all he amenities that a civilized population can give. Transport can sually be arranged without difficulty, and on collecting expeditions he impedimenta of baggage is an important consideration. Food, and easonably good food, can be bought; and except for the gangs of dacoits hat seem to abound in all open country, the people are not hostile, lthough they are often very suspicious. When I went into the interior f Hainan with my wife, and we travelled in country where most of the eople had never seen a European, we finished the trip with the impression hat we had had one of the best picnics of our lives.

The fact that there were no roads or railways in the early days resented no obstacles to travel. Southern, central and eastern China one great network of rivers, lakes and canals. And across the ountains connecting all the main towns were regular routes for traffic. ver these routes transport was by man-carrier. It was by water that he early naturalists made most of their journeys, and made them in omfort. When I read Fortune's accounts of his travels I cannot dis- over that he ever slept in a tent. When he left his boats he lived in ns and, as he often tells us, in temples. Of the two, the temples were he more comfortable. Travelling in China in 1840 through the great a and silk districts was easier and more comfortable than travelling England in the same period. The men who suffered hardships, the fficulties with food and water, and the intense cold at high altitudes ere those who explored the mountainous country and desert regions of he north and west, the provinces bordering on Mongolia, Turkestan and

Tibet. The two zoologists whose names stand out in travel in those regions are the Frenchman Armand David and the Russian Prjevalsky.

The earliest collectors of botanical material in China go back to the 17th century. I do not know of any zoologist in the country until the 19th century, and the first man who systematically worked there was John Reeves, of whom you have already heard something on the botanical side. He lived in China from 1808 to 1831, and he appears to have spent all his time at the Portuguese settlement of Macao or at Canton, a little further up the river. By the treaties with China at the time he was forbidden to visit the interior of the country, but that does not mean that he did not get any of his material from the interior. Some of his specimens came from hundreds of miles away. The distribution of most of the species that he obtained is accurately known today, and it certainly is not Macao or Canton. Some of his reptiles live only in mountainous districts; the beautiful pheasant that bears his name came from the far north, somewhere west of Peking; his monkeys are found only in thickly forested country, and there is no forest anywhere near Canton. Many more instances could be named.

The sources from which he obtained so many of his specimens were the native markets, to which were brought every kind of creature. Many of the wealthy Chinese had aviaries; some of them kept the smaller mammals; and in the tanks and ponds in their gardens they kept fishes and tortoises. A traffic in living creatures has been going on all over China for hundreds, if not thousands, of years. In a rare work in the library of this Society called 'The Natural History of China', published first in 1798 and again in 1842, we find this remark in the introduction: 'It is true we continue to receive numerous boxes of insects from China, chiefly purchased in the shops of Canton, but, like everything else from China, there is such monotony in these arrivals that it is impossible to discover in those boxes a single species that is not contained in all the rest. It is evident that considerable employment is produced by the rearing of the Atlas Moth and in the collection of other insects, of which we have numerous examples'. At what date these collections began to arrive in this country I have not discovered.

And to the markets, too, came the food, and particularly the fish. Reeves was a Fellow of this Society, and in his obituary notice, which appeared in our *Proceedings*, we are told that he 'caused beautiful coloured drawings to be made of no fewer than 340 species of fish which are brought to the markets of Canton'. He had four copies made of each one. He kept one set for himself and distributed the others. Whether he had four copies made of all his species I do not know, but he certainly had many duplicates.

The food markets in China are valuable collecting grounds for the zoologist, for there is very little flesh that is not eaten by somebody. The wealthy Chinese are great epicures in the matter of food—you must not judge Chinese cooking by the food you get in the Chinese restaurants in London—but the filthy concoctions that are sold to the poor, particularly in the form of sausages, are best not described. A rare sea snake was once rescued by my native collector as it was about to disappear entire into the mincing machine, and Mr. Pope, of the

merican Museum of Natural History Expedition to China, told me of a hrew, still the only specimen known, that was procured by him under he same circumstances.

Reeves was a collector. He did not describe his specimens. He new little about their systematics. He wrote some popular articles n Chinese vertebrates after he left the country, and his only contribution o scientific literature is a book on Chinese Materia Medica. But he left s a priceless collection of over 500 water-colour sketches of mammals, irds, fishes, reptiles and invertebrates, made in his house by native tists under his supervision. Most of them are very accurately drawn, ut occasionally the artist has given play to his imagination, as, for stance, when he has depicted a well-known lizard with the feet of a ragon.

The second zoologist on my list—to place them in chronological rder—is also an Englishman, namely, Robert Swinhoe. He served for ineteen years in the Consular service in China, and during that period pent every moment of his spare time in the study of natural history. is duties confined him to the coastal provinces, but his position gave m opportunities for travel, of which he took full advantage; and herever he went he collected. In the name of commercial investigation o discover the possibilities of trade, he explored—in a British gunboat—he island of Hainan, and by the same means he circumnavigated the land of Formosa. In his narrative of the trip round Formosa he tells s 'the Admiral insisted upon our associating the pursuit of pirates ith our more peaceful occupation of hunting for information'. irates at sea in his time were apparently just as plentiful as dacoits n land. As a commercial investigation also he sailed up the Yangtse a native boat into the province of Szechuan. It was his only trip to the interior of the country. Swinhoe collected both animals and ants, but his chief interest was always birds, and he may be rightly lled the father of Chinese ornithology. Like John Reeves, he knew e value of the native markets as collecting grounds, and he visited em whenever he stayed at a town. In one of his narratives he tells how, on one occasion, he found a number of cranes walking about a shop. They were not tethered in any way, but to prevent their ring had been blindfolded by sewing their eyelids together. It is a ethod of restricting the movements of captive wild creatures that is idely employed in China, for mammals as well as birds. He was a nstant contributor to the 'Ibis' and to the 'Proceedings of the ological Society'. Most of his articles dealt with birds. A list of the ants collected by him will be found in Bretschneider's 'History of otanical Exploration in China'.

My third great zoologist, and the first to enter wild and unknown untry, is the French missionary Father David. In 1862, at the age 36, he was sent to the Mission College at Peking, and immediately ve evidence of his intense interest in natural history by collecting ery living thing in the country round about. He gave much more of s time to biology than to theology, but, we are informed, with the ll approval of his ecclesiastical superiors. His collections were sent Paris, and they were thought by the learned professors there to be

so valuable that he was requested by them to continue his researches at their expense. He was given permission to leave the College and to explore, as they termed it, the less known portions of the Celestial Empire. He fulfilled their wishes nobly.

Altogether he made three journeys, all in the north and west of the country. He travelled lightly, for the funds allowed him from Paris were never on a liberal scale. On his last and longest journey, which took him to the borders of Szechuan, he was obliged to limit his baggage to 300 pounds, which was conveyed in a hand-cart (charette). Thus, with two trained Chinese assistants, who acted also as his ' domestiques ', he set forth on a journey which was to occupy him two and a half years. To the collector of today, embarking on an expedition to cover some 3,000 miles, such equipment would seem ridiculously inadequate.

On his main routes of travel he followed the big towns, and, using them as a base, made excursions into the neighbouring country, particularly into the mountains. The hills always fascinated him, and it was on their wild and forested slopes, still untouched by the wood-cutter, that most of his greatest discoveries, both in animals and plants, were made. Yet even in the most remote parts of China he was never quite isolated from his own people. The French missionaries were there before him, and in all the important towns had established their stations. They were ready to welcome him, to entertain him, and to help him in whatever way they could.

Finally, after ten years of travel and hardship, his health broke down and he retired to his native country.

David was interested in all animal and plant life, but birds were always his particular delight. His note-books are full of the accounts of the birds he met on his travels, and his book on the ' Birds of China ' which he compiled with M. Oustalet after he left the country, is still one of the standard works on the subject. He was the first naturalist to see the Giant Panda, and he was instrumental in finding the deer (*Elaphurus davidianus*) which is named after him. He did not discover the creature in its wild state. There was a herd in the Imperial Hunting Park in Peking—a walled enclosure of nearly 100 square miles—and David managed to procure a specimen and send it to Paris. It was not known to exist in any other part of China. Later on specimens were sent to the Zoological Gardens in London, Paris and Berlin. All these are now dead. When the Boxer Rebellion broke out in 1900, and parts of the enclosure were knocked down, the herd escaped ; but it was later recaptured and bought by the Duke of Bedford and brought to England. So we now have the curious position of a Chinese species of deer apparently extinct in its own country, and existing only as a small herd in Woburn Park.

My fourth and last zoologist is the Russian Prjevalsky. He has not been mentioned by any botanist in connection with this meeting, but he did a great deal in his travels to investigate the botany of the regions he travelled in. Nicholai Michalovitch Prjevalsky was a Pole by birth, but as the Poland in which he was born belonged to Russia at that time he entered the Russian army, as all young men of his time had to do. His life was spent, however, not in military service, but in exploring

nd collecting specimens of natural history in Mongolia and in the Chinese Empire. His journeys were made entirely by land. In his ime the Trans-Siberian Railway had not been constructed, and the ourney to China had to be made by carriage, the troika with three orses abreast in summer, the sleigh in winter. By adopting and mproving the caravan routes already in existence, the Russians had nade it possible to travel right across Asia, a distance of some 6,000 miles, by this means. Every 15 or 20 miles a post-house with fresh horses vas available, and a man with influence could do as much as 200 miles n the 24 hours. By this means Prjevalsky reached the borders of China. On his journeys into the country he would have ponies for iding and camels to convey his baggage. Twice he crossed the Gobi lesert to reach Peking, for without the necessary passports and letters, vhich could be issued only in Peking, he could not travel in the country. His journeys were ones of great hardship. Food was generally scarce nd difficult to buy, and he had to rely very largely on his gun for meat. One of Prjevalsky's ambitions was to reach Lhasa, and on his third xpedition across China he endeavoured to do so. But when only 200 miles away he had to turn back because his funds were exhausted. On this journey, which occupied three years, he took back to Russia ,200 specimens of vertebrates, 3,000 insects and 4,000 specimens of plants. He died on his fourth expedition in Turkestan at a town called Karakol. After his death its name was changed to Prjevalski, to commemorate his achievements, and it bears that name to-day.

Many other zoologists could be mentioned in connection with the exploration of China, but the four whom I have mentioned stand out above all others as pioneers. They spent years in the country; they were all animated by an intense love of natural history; and between them they managed to build up for us a fair picture of the main faunal structure of the country. Western China still remains a great hunting ground, but from now onwards the chief work in zoology will be done, I think, by the Chinese themselves. The many papers which have appeared from their hands in the last twenty years are evidence of the wide interest which they take in the subject.

Discussion.—

Mr. N. B. Kinnear suggested that the names of G. Forrest, J. F. Rock, Ricketts and Touche might be remembered for their observations on birds.

Col. F. R. S. Balfour reminded the meeting that E. H. Wilson has given valuable information on birds in his 'A Naturalist in Western China' (1913).

PAPERS ON THE EXPLORATION OF CHINA.

5. BOTANICAL EXPLORATION IN CHINA DURING THE LAST TWENTY-FIVE YEARS.

By Dr. Hui-Lin Li.

The beginning and the growth of Chinese botanical research, wherein Chinese workers themselves undertook a study of the vegetation of

their own country on a scientific basis, belongs to the past twenty-five years. Along with the political revolution and the overthrow of the Manchu Dynasty in 1911, and the cultural revolution or the new cultural movement of 1915, the seed of modern science was sown and has germinated. In botany, as in the development of this science in the West, the systematic aspects were first emphasized; for the Chinese themselves realized that, basic to other research work in plant science, was the necessity of knowing the names and the relationships of the plants themselves. Since 1920 the development has been rapid, and it may be claimed that progress in systematic botany is one of the outstanding achievements by Chinese scientists during this short period.

The pioneer work of western collectors in China during the past century, and the deep interest of western botanists in the study of the Chinese flora, have naturally stimulated and inspired Chinese students in this field. The China Foundation for the Promotion of Education and Culture has greatly forwarded, during the past twenty years, the advancement of natural sciences, particularly systematic botany, in China by sending Chinese students to the leading herbaria in Europe and America, such as the Royal Botanic Gardens, Kew, the Royal Botanic Gardens, Edinburgh, the Paris Museum, the Berlin Botanic Garden, the New York Botanical Garden, and the Arnold Arboretum. Some of these institutions, such as the New York Botanical Garden, the Arnold Arboretum, and the Royal Botanic Gardens at Edinburgh, have also helped by making grants, on a distinctly extensive scale, to Chinese institutions for co-operative fieldwork in different parts of China. And last, but not least, the serious-mindedness of Chinese workers themselves, their zest, zeal and disinterested endeavours have brought gratifying results. There are at the present time well organized departments of biology or botany in many colleges and universities, supplemented by government or private research institutes and by scientific societies, all actively engaged in botanical work. Botanical explorations have extended to the remote parts of the country. While the flora of many parts of the country is reasonably well known, vast areas had not previously been intensively explored. In addition to systematic botany, researches in other phases of plant science have been initiated and placed on a sound basis.

I judge that the first Chinese botanist who collected herbarium material systematically on a large scale was the late Prof. K. K. Tsoong, of the National Peking University. He collected as early as 1908 in Kwangtung, and subsequently in many other provinces. He continued his field work for a number of years, and his collections exceed 1,500 numbers, their sources being largely from Anhwei, Chekiang, Kiangsi, Kwangtung, Szechuan, Yunnan, and Shansi, and, in a less measure, from Hupeh, Honan, Fukien and Kwangsi. His pioneer work deserves notice, and his name is worthily commemorated by the verbenaceous genus *Tsoongia* Merrill, which was discovered by him in Kwangtung.

However, it was not until a number of Chinese botanists, who had received their training in the various botanical institutes of Harvard University from 1916 to 1925, returned to China and actively engaged in botanical exploration and investigation, that the development of

otany in China gathered momentum. Among them were specialists in lant taxonomy who not only initiated field work but also founded, nd developed a number of herbaria and scientific institutes that became eading local centres of botanical research. At the same time they aught and inspired a host of younger botanical students. Among hem are Prof. S. S. Chien, Dr. H. H. Hu, Prof. W. Y. Chun, Prof. H. H. Chung, and Prof. Y. Chen. Prof. Chien has the credit of being the rst Chinese botanist to name and describe new plant species. As a esult of his studies in the Gray Herbarium of Harvard University, he ublished two new species of *Ranunculus*, *R. arcuans* and *R. brachy-hynchus*, in 1916. He taught in the National South-eastern University or many years and collected in Kiangsi as early as 1915 for the her-arium of that university, this herbarium being one of the earliest in hinese institutions. He now heads the botanical division of the iological Laboratory of the Science Society of China. Professor Hu udied at the Bussey Institution and the Arnold Arboretum of Harvard niversity from 1921 to 1925. Previously he taught in the National outh-eastern University and prosecuted extensive field work in 1920 nd 1921 in the interior of Chekiang and Kiangsi Provinces. He later tablished the botanical division of the Biological Laboratory of the cience Society of China and the botanical division of the Fan Memorial nstitute of Biology. He is now the director of the latter institute and lso president of the newly established National Chung Chen University, here a strong department of botany is rapidly developing under his irection. Professor Chung studied at the Bussey Institution and the rnold Arboretum of Harvard University from 1916 to 1919, issuing his Chinese Economic Trees ' in 1922, the first botanical volume in the nglish language prepared by a Chinese botanist. In 1920 he conducted n extensive botanical exploration in Hainan on a Milton Fund Fellowship om Harvard University, being the first Chinese botanical explorer of iat tropical island. Unfortunately most of his botanical collections ere destroyed by fire after his return from the field. Later, he founded ie Botanical Institute of Sun Yatsen University. Professor Chung udied at Harvard from 1918 to 1920, and at the Arnold Arboretum ompiled his ' Catalogue of the Trees and Shrubs in China ', published the ' Memoirs of the Science Society of China ' (I, no. 1) in 1924, the cond botanical work in English by Chinese students. From 1922 to 930 he collected extensively in Fukien for the herbarium of Amoy niversity. He now teaches at the National Wuhan University. rofessor Chen studied at Harvard from 1922 to 1925. Previously, the dean of the Kiangsu Provincial College of Forestry, he conducted ld work in China in about 1915. He is largely responsible for the velopment of the Forestry Department of the University of Nanking.

The rapid advancement of Chinese botany during this period owes uch to the assistance and co-operation extended by western scientists their Chinese colleagues. Their contributions have been directly ncerned with the promotion of botany in China. Dr. E. D. Merrill, irector of the Arnold Arboretum of Harvard University, has for many ars stimulated and assisted Chinese botanists to initiate productive ork. He assisted in the establishment of the herbaria of Lingnan

University and the University of Nanking. In connection with herbarium problems at Lingnan, he visited Canton in 1916 and conducted collecting trips with the Lingnan group in the vicinity of that city. He again visited Canton in 1917 and undertook an extensive collecting trip to Lofoushan. These trips initiated the extensive field work later developed at Lingnan. In 1922, he visited Nanking and helped to start the herbarium at the University of Nanking. The current collections prepared for Lingnan from Kwangtung and Hainan were submitted to him for identification, and during the many years following he has made numerous identifications for Lingnan, Nanking and many other Chinese herbaria. He also worked extensively with Prof. W. Y. Chun on the Hainan collections made by the Botanical Institute of Sun Yatsen University. From 1916 up to the present, the different institutes successively under his directorship—the Bureau of Science at Manila, the College of Agriculture of the University of California, the New York Botanical Garden, and the Arnold Arboretum—have all co-operated with Chinese institutions in botanical exploration, and thus have greatly extended their activities. The work of Dr. Merrill on Chinese botany, his continuous interest and his cordial co-operation with Chinese botanists have been of direct importance in the development of botany in China.

Professor Sir William Wright Smith, Regius Keeper of the Royal Botanic Gardens at Edinburgh, is another authority on the Chinese flora whose work on the extensive collections of G. Forrest in northwestern Yunnan has greatly extended our knowledge of the wealth of the flora of China. A third authority was the late Dr. Handel-Mazzetti, who conducted extensive explorations in western China, and whose 'Symbolae Sinicae' (Botanische Ergebnisse der Expedition der Akademie der Wissenschaften in Wien nach Südwest-China, 1914–1918, 7 pts., 1929-37), based largely on his own collections, is a monumental work on the flora of China. He also worked extensively on R. C. Ching's collection of Kwangsi plants and Y. Tsiang's collection from Kweichow. Other authorities are L. Diels of Berlin, Dr. F. Gagnepain of Paris, and Prof. A. Rehder of Harvard.

I shall now deal with the botanical exploration as prosecuted by the various institutions, limiting myself to those mainly concerned with vascular plants. In the twenty-five years under review botanical fieldwork was first sponsored by certain educational institutions, the earliest and most important being the National Peking University, the National South-eastern University (now the National Central University), the Lingnan University, and the University of Nanking. Similar activities were initiated later in other universities, and in the late twenties and early thirties, scientific institutes, both government and private, increased in number, some of them undertaking botanical survey work on a large scale. At the same time the interests of the various botanical and biological departments of these institutions extended to other fields of plant science, such as morphology, physiology, mycology and plant pathology. The herbarium aspects have been consistently maintained by Lingnan and Nanking Universities as well as Sun Yatsen University and other institutions.

Shortly before the Sino-Japanese War commenced, in 1937, botanical exploration, especially in south-western China, had become very active. The interest in plant exploration was developed in several additional universities, and some new institutes were established with intensive plans for prosecuting botanical survey of various provinces. The present war, however, has greatly interrupted the work of many of the institutions. Because of the existing limitations on means of communication, it is now impossible to collect data regarding the most recent developments: thus in this respect my presentation cannot be so detailed and complete as I would wish.

I will first discuss the work of the different independent or semi-independent research institutes under whose auspices most of the botanical exploration has been undertaken, and will follow with a consideration of the contributions made by the herbaria of the different universities; and finally, I will give a brief summary of the work of foreign collectors in China during the past three decades.

(i) Among the research institutions specializing in botanical survey work, the first to be established was the Biological Laboratory of the Science Society of China at Nanking in 1922, organized by the staff members of the biology department of the National South-eastern University of Nanking. Considerable field-work had been prosecuted by the University up to that date, and this was increased by the Biological Laboratory. In 1926, C. L. Tso and others made extensive collections in the vicinity of Nanking and in other parts of Kiangsu Province, accumulating about 3,000 numbers of herbarium specimens. This work was later continued by Y. L. Keng and others. From 1926 to 1937 considerable attention was given to the exploration of Chekiang Province, with the preparation of a flora of that province well developed when the present war disrupted the plan. Individuals operating in the field were H. H. Hu, Y. L. Keng and S. S. Chien in 1926–9, and W. C. Cheng in 1929 and 1931–2. In 1931, C. Pei also collected along the coastal regions of Chekiang and Fukien. The flora of southern Anhwei also received considerable attention. In 1926, S. S. Chien collected in Hwangshan for Tsinghwa University, and this region was again visited by W. C. Cheng and C. Pei in 1935.

In addition to work on the flora of south-eastern China, Szechuan has been intensively explored by the Biological Laboratory through many years, and the work is still in progress. In 1927, W. P. Fang collected along the Szechuan-Kweichow border, a region to that date unexplored. In 1928, a very extensive exploration was undertaken by Fang in Szechuan with the financial co-operation of the Arnold Arboretum. Fang and his men spent eight months in the field and covered a very large part of the province: no less than 4,000 numbers were gathered, up to then the largest single expedition undertaken by Chinese botanists. In 1929, Fang continued his Szechuan exploration and again spent the larger part of the year in the field. In 1930, Fang and W. C. Cheng, in co-operation with F. T. Wang and T. Tang, of the Fan Memorial Institute, conducted another extensive trip to Szechaun. This time the party succeeded in penetrating the forbidden Lololand in southern Szechuan, close to the Yunnan border, a remarkably rich region.

In 1931, W. C. Cheng continued the Szechuan work, this time largely covering the alpine regions of north-eastern Szechuan and adjacent parts of Sikang. In 1936, at the request of the Construction Bureau of Szechuan, he conducted an extensive forest survey of that Province.

In 1934–5, an expedition to Yunnan Province was jointly undertaken by the Biological Laboratory and the Agricultural College of the National Central University under the leadership of M. Chen. From 1934 to the spring of 1935, successful excursions were made in different parts of the province, over 3,000 numbers of vascular plants being secured. Unfortunately, in April that year, while in the field in southern Yunnan, Chen died of malaria. His untimely death cut short a promising career.

In 1937, because of war conditions, the Biological Laboratory was moved to the interior with temporary quarters at Pehpei, Szechuan. From that place, in addition to continuing the exploration of the flora of Szechuan and Sikang, the laboratory devoted much attention to a study of the forests of western China and their resources, and to a survey of economic plants in general.

(ii) The Fan Memorial Institute of Biology was formally opened in the winter of 1928 in Peiping, with Dr. H. H. Hu as head of the botanical division. The first field exploited was Hopei Province. From 1928 on Messrs. T. Tang, F. T. Wang, C. F. Li, H. F. Chow, H. T. Tsai, H. W. Kung, T. T. Yü, and others, under the auspices of the institute, successively explored the environs of Peiping, Nankow, the Ming Tombs, Hsiao Wu Tan Shan, and many other localities. The virgin forests of the East Tombs, conserved through the years of the Imperial Manchu Dynasty, received much attention. In 1929, T. Tang, in co-operation with W. Y. Hsia, of the College of Agriculture of the National Peiping University, conducted an extensive botanical tour in Shansi over a period of five months, covering about three-fifths of the Province, including the most important mountain ranges. From 1929 to 1931, F. H. Chen carried out three successive botanical excursions in the north-eastern part of Kirin Province, especially Ching-po-hu Lake and its vicinity. In 1930, T. Tang and F. T. Wang, in co-operation with members of the Biological Laboratory of the Science Society of China, collected in Szechuan, covering much of the western, northern and southern parts of that Province.

In 1932, an expedition headed by H. T. Tsai was sent to Yunnan, commencing an extensive botanical exploration which has been continued in succeeding years by the Fan Memorial Institute and other Chinese institutions in this botanically rich province. This expedition also succeeded in penetrating the Lololand along the Szechuan-Yunnan border, a region inhabited only by aborigines, and hitherto little explored. This party covered the northern, eastern and south-eastern parts of the province. Tsai collected in Yunnan up to 1934, and his work was continued by C. W. Wang from 1935–7. Wang's collecting ground in 1935 was largely the alpine north-western Yunnan and adjacent part of southern Sikang. In one year over 8,000 numbers of vascular plants were assembled. In 1936–7 he collected in the tropical part of Yunnan, exploring the primaeval forests and jungles of malarial-ridden southern Yunnan, which had formerly been little known from a botanical stand-

point. Tsai and Wang succeeded in carrying out the most extensive botanical explorations in China during recent years and assembled large and important collections. These Yunnan expeditions were particularly important because many previously unknown areas were explored; the field-work involved many difficult problems in dealings with hostile aborigines, protection of personnel against infections, and provision of supplies. The field-work was in part supported by grants from the Arnold Arboretum.

In 1933, the Fan Memorial Institute, together with the Biological Laboratory of the Science Society of China, projected a biological expedition to Hainan, several other organizations participating, such as the Academia Sinica and Shangtung University. The botanical section was headed by C. L. Tso and the party spent the larger part of a year in the field. In 1935, S. K. Teng and others collected in Chahar, in addition to Hopei. In 1936, he spent four months collecting in Kiangsi, covering the eastern, northern and western parts of the province.

The Fan Memorial Institute, in co-operation with the Provincial Government of Kiangsi, established the Lushan Arboretum and Botanical Garden at Lushan in 1934, with R. C. Ching as the director. Because of war conditions, it was later moved to the west, and is now located in Likiang in north-western Yunnan, and is actively engaged in the investigation of the alpine flora of that region. Much herbarium material has been collected in recent years by R. C. Ching, K. M. Feng, Y. S. Liu, and others.

At the outbreak of the Sino-Japanese War, in 1937, Peiping was immediately involved in hostilities, and the work of the Fan Memorial Institute was greatly disrupted. Since then, field-work of the Institute has been concentrated in Yunnan. With the financial co-operation of the Royal Horticultural Society, London, the Royal Botanic Gardens, Edinburgh, and the Arnold Arboretum, T. T. Yü, J. C. Liu, M. K. Li, and C. W. Wang, permanently stationed in Yunnan, have conducted field-work on a large scale throughout the province. In 1937–8, T. T. Yü explored extensively the alpine region of north-western Yunnan, ascending the snow range of the Salween Divide, which few civilized men had previously visited. Wang continued the survey of south-eastern tropical Yunnan and accumulated a vast collection of over 14,700 numbers up to 1942. In addition to the continuation of the exploitation of the Yunnan flora, work is being done on economic plants as an adjunct to the war effort. To ensure permanency and continuation of the work in Yunnan, the Institute, in co-operation with the Provincial Government of Yunnan, established the Yunnan Botanical Institute in Kunming in 1939, and it has been active in the field.

(iii) The Botanical Institute of Sun Yatsen University at Canton was formally opened in December 1929, with Prof. W. Y. Chun as its director. Its immediate programme was a systematic survey of the flora of Kwangtung and Hainan. As early as 1927 exploration work was under way in many localities in Kwangtung and Hainan, conducted by W. Y. Chun and Y. Tsiang. As many as fifteen trips were made in 1927 in Hainan and Kwangtung, seventeen in 1928 in Kwangtung, and twenty-six in 1929 in Kwangtung. With the formal organization of the institute in

1929 the services of many collectors were enlisted and field operations greatly extended. The Hainan work was particularly successful. Up to 1933 no less than 109 expeditions had been sponsored, with a total of 31,836 numbers, secured in Kwangtung and Hainan alone. Later field-work was extended to Kwangsi and Kweichow on a large scale, and with important results. When the war extended to southern China in 1938 the programme was interrupted.

The increase of our knowledge of the Hainan flora through the operations of the institute is an outstanding achievement in Chinese botany of recent years. Professor Chun himself, early in 1920, made the first Chinese collecting trip to Hainan. The difficulties involved and the serious purpose of the work of Chun and his collectors may be summarized by the words of Dr. H. H. Hu, who states that Chun ' was the first botanist who penetrated into the interior of the botanically little-known tropical island, Hainan, and succeeded in climbing the mysterious Five Finger Mountain, braving the peril of dangerous diseases, land-leeches, and the privation of provisions amidst the barbarian tribes of Lai, Miao, and other aborigines. A staggering large quantity of precious herbarium specimens has been collected from Hainan lately. Often the collector Professor Chun engaged had to climb to the top of the sea of tropical forest in order to locate some seemingly rare trees, and then to intimate the way of travelling of a gibbon or orang-outang by swinging from the branches of one tree to another. Sometimes the climbers would be surprised by the treacherous " ghost tree ", whose seemingly large trunks shrink in their embrace on account of their heavy moss-covering. To make a living collection of rare and showy orchids, often a tree is cut down and a whole section of trunk with the attached epiphytic orchids *in situ* is removed and transported back to Canton ' (Peiping Natural History Bulletin ', IX, p. 73 ; 1934).

The Institute has succeeded in exploring in most parts of Kwangtung Province, including the mountainous regions along the Kiangsi, Hunan and Kwangsi borders, mostly unexplored previously. In addition to Prof. Chun and Y. Tsiang, many other collectors have, through the years, laboriously worked in the field in both Kwangtung and Hainan in quest of specimens for the Institute. They include N. K. Chun, H. Y. Liang, C. Wang, S. P. Ko, C. L. Tso, H. T. Ho, Z. S. Chung, S. K. Lau, S. W. Teng and H. C. How. In 1935, Prof. Chun founded the Botanical Institute at Kwangsi University, which planned, in co-operation with the Botanical Institute of Sun Yatsen University, to survey the forest flora of Kwangsi. Explorations were immediately commenced. Two expeditions were conducted in 1935 and four in 1936 by H. Y. Liang, Z. S. Chung and S. P. Ko in different parts of the province.

In 1936, an expedition was sent by the Botanical Institute of Sun Yatsen University to Keichow, headed by S. W. Teng, for an intensive three-year exploration of the entire province. The party had covered many parts of the province, making extensive collections, when, in October of that year, three field assistants were successively stricken by the severe type of malaria prevalent in certain parts of Kweichow, and died within a few days. Soon Teng himself succumbed to the same

lisease at Chenfeng, and the three other members of the party of seven ecame dangerously ill. This was a tragic page in the history of botanical xploration in China. Teng had proved himself a very able explorer n his short but productive career, and his death was greatly mourned y botanical workers in China. The work in Kweichow was continued y C. Wang and others.

When the war extended to southern China, in 1938, field-work of the nstitute in Hainan and Kwangtung ceased. The Institute moved to Hong Kong, while the University was transferred to Yunnan. During 939–40, explorations were prosecuted in various parts of Yunnan. pecial emphasis was placed on a consideration of economic plants. The University later moved back to the interior of Kwangtung Province, ut nothing is known as to the fate of the herbarium and botanical brary in Hong Kong when it was occupied by the Japanese in December 941.

(iv) In January 1930 the National Government established the Metropolitan Museum of Natural History in Nanking as a department f the Academia Sinica, the national research institute. This was later nown as the National Research Institute of Zoology and Botany of he Academia Sinica. Previous to its development, the Ministry of Education had sent a scientific expedition to Kwangsi in 1928, the otanical section of the group being headed by R. C. Ching. The party pent the larger part of the year in the field, covering many different reas, travelling some 3,000 *li* (=1,000 miles). Over 2,600 numbers of lant specimens were collected. Ching and his group reached the ysterious Shih Wan Tai Shan, a mountain range extending from east o west over 500 *li* along the Kwangtung-Kwangsi border, not far from he north-eastern border of Indo-China. This range is covered by dense ropical forests and is very sparsely populated, and that by Miao borigines, little known to civilized people. The aboriginal Miao people o-operated very fully, and their skill in tree-climbing and interest in he field-work increased the value of the collections. In a period of orty days over 800 numbers of plants were secured. Later the field-work as extended to Yao Shan, a mountain range along the Kwangtung order, rich in plants, previously little known botanically, and also a egion occupied by Miao people. The novelties found in Ching's col- ection were exceedingly numerous and interesting, and his trip was not nly outstanding in the study of the Kwangsi flora but one of the most uccessful in the annals of Chinese botanical exploration.

The Museum subsequently sponsored other expeditions to Kweichow, zechuan and Kiangsi. The Kweichow expedition, headed by Y. Tsiang, as in the field from April 1930 to May 1931, and proved to be very uitful. What was previously known of the flora of Kweichow had been ue largely to the work of French Catholic missionaries.

The National Research Institute of Zoology and Botany has concerned self with the collection and study of algae and fungi, as well as vascular lants, and extended its research into other branches of botanical cience. In 1937 it was transferred to Pehpei, Szechuan, because of dverse conditions brought about by the war with Japan.

(v) The Institute of Botany of the National Academy of Peiping was founded in 1930 at Peiping, with T. N. Liou as its director. Exploration work under its auspices has been mainly confined to north-western and northern China. Up to 1937, extensive field-work was prosecuted in Hopei Province by T. N. Liou, K. S. Hao, H. W. Kung, W. Y. Hsia, K. M. Liou and others, and, in addition, numerous trips were made in other northern provinces—Shansi by W. Y. Hsia in 1929, Liaoning and Chahar by H. W. Kung in 1930, Kirin by H. W. Kung in 1931, Chahar and Suiyuan by W. Y. Hsia in 1931, and Suiyuan by T. P. Wang in 1934. In 1930, T. N. Liou made a collecting trip along the coastal regions from northern to southern China, covering the shores of Shangtung, Kiangsu, Chekiang, Fukien and Kwangtung. Shangtung was also botanized by K. S. Hao in 1931, K. M. Liou in 1933 and T. P. Wang in 1935. Honan was visited by K. S. Hao in 1931 and K. M. Liou in 1935. Shansi, especially the southern part, was explored by K. S. Hao in 1932 and 1934, and by H. W. Kung in 1933 and 1935. Anhwei was explored in 1935 by T. N. Liou and P. C. Tsoong.

Besides these expeditions, several more deserve notice. In 1930 K. S. Hao, as a member of the Sino-Swedish Expedition to central Asia, conducted an extensive botanical tour in western China. He successively explored the northern part of Szechuan, the Lama Shan in the district of Minchow in southern Kansu, Lanchow, the capital of Kansu, and then to Lake Kokonor and Sinning, the capital of the province Chinghai (Kokonor), and then south to the high mountain Amne Matchin, and finally toward the north along the Yellow River region in Inner Mongolia. In 1931, T. N. Liou participated in the Central Asiatic Expedition of the French Government to Sinkiang, the most distant province reached by Chinese botanists. In 1936, an extensive expedition was carried out by the Academy in Kansu and the eastern part of Chinghai by T. N. Liou, W. Y. Hsia, T. P. Wang and C. M. Liou, each heading a division following separate routes.

At the outbreak of war in 1937, Peiping had to be evacuated: the Institute moved to Sian, and exploration is now centred in north-western China.

A year earlier, i.e. in 1936, a botanical survey of north-western China had been initiated in Sian jointly by the North-western College of Agriculture and Forestry and the Botanical Institute of the Peiping Academy, under the directorship of T. N. Liou. The plans involve the establishment of a botanical garden and a survey of the flora of north-western China. Its immediate objective is a study of the flora of eastern Chinghai and the Tsinling Range, field work being projected to cover several years.

(vi) The Botanical Garden of the Sun Yatsen Memorial Park in Nanking, under the directorship of H. Y. Fu, was active between 1930–7 in the introduction of ornamental and economic plants into cultivation. Several trips were sponsored to various parts of Chekiang, Szechuan, etc., for the collection of seeds, living plants and herbarium material,

(vii) The Science Institute of western China, established in 1931 in Pehpei, Szechuan, is chiefly limited to work on problems affecting Szechuan, Sikang and Tibet. The botanical division has been active in field work, the more important collections being made by T. T. Yü in Szechuan and Sikang, and Y. S. Liu in Sikang in 1933–4, T. H. Ho in Mt. Omei in 1935, and C. S. Chu in eastern and northern Szechuan in 1935.

Herbaria.

The herbaria of the National Peking University and the National South-eastern University were among the earliest ones to be established. That of the Lingnan University and that of the University of Nanking are extensive and their activities have been continuous. Many other universities maintain local herbaria, some of considerable importance. During recent years a revival of interest in botanical exploration is evident, particularly among the universities in the south-west. The flora of this mountainous region is ever attractive to explorers, and much still remains to be done. The moving of many cultural institutions to this region from coastal provinces because of the war has increased interest in botanical problems.

(α) The herbarium of the National South-eastern University at Nanking is among the oldest in China. Early in 1915, S. S. Chien collected in nearby parts of Kiangsu Province. In 1920, H. H. Hu explored the interior of Chekiang Province, and the next year the interior of Kiangsi Province. In 1920, W. Y. Chun collected in Hainan. Unfortunately these early collections were lost when the building in which they were housed was destroyed by fire. During the early twenties it was very active in field work, particularly in south-eastern China. While Kiangsu was not neglected, Chekiang was visited by F. C. Cheng in 1924 and R. C. Ching in 1924–5; Anhwei, especially the southern part and Hwangshan, was explored by W. Y. Chun in 1924 and R. C. Ching in 1925; the mountainous western part of Hupeh was explored by W. Y. Chun in 1922; and Fukien was explored by R. C. Ching in 1925. With the herbarium well established, active exploration was later reduced and research in botany was extended to other fields. The botanical field-work was taken over by the Biological Laboratory of the Science Society of China as part of a definite and long-term plan of surveying the fauna and flora of the Yangtze Valley.

(β) The herbarium of Lingnan University in Canton was established in 1916 with the assistance of Dr. E. D. Merrill, then of the Bureau of Science of Manila, who helped to train student workers and who visited Canton in 1916 and 1917, exploring nearby regions in company with the Lingnan staff members. During these two years, G. W. Groff, W. O. Levine and field collectors K. P. To and L. S. Kwok collected around Canton and other parts of Kwangtung Province, gathering over 5000 numbers of herbarium specimens. In 1919, Groff and To collected at T'ang Yuen, Kwangsi Province, this being one of the earliest collections made in this botanically little-known province. Another brief visit was made by F. A. McClure and To to Wuchow, Kwangsi, in 1924.

More extensive explorations in that province by Lingnan staff members were made at a much later date. In 1920, Groff and To collected in Indo-China and Siam, collecting 514 specimens, and in 1921 McClure and To, in the company of Dr. A. S. Hitchcock, collected in Indo-China (Tonkin and Annam), these being among the first of the collecting trips undertaken by Chinese educational institutions outside China. One of the most distinctive achievements made by the Lingnan Herbarium is its thorough and persistent exploitation of the Hainan flora. McClure and To made the first trip to that tropical island in 1921, one year later than Prof. Chun's pioneer excursion, taking 1,426 numbers. Again in 1922 McClure, To and W. T. Tsang conducted the second expedition, collecting 1,000 numbers. Both these trips were spent in the northern coastal regions and the central mountainous regions, including the rather inaccessible Five Finger Mountains. The third expedition was undertaken by W. T. Tsang in 1927, and from that year to 1935 no less than twelve expeditions were sent to Hainan. The collections made average about 1,000 numbers for each trip. Work was extended to all parts of the island. Later trips, supervised by Dr. F. P. Metcalf, were so planned that the party would be in the field for an entire year, in order to take advantage of the seasonal differences in the tropical island. In addition to its work on the Hainan flora, the Lingnan group has extended the work to various parts of Kwangtung and neighbouring provinces.

In 1933–7, several expeditions were sent to Kwangsi Province, conducted by W. T. Tsang and others, who made very extensive surveys in northern and south-eastern Kwangsi. In 1937–40, W. T. Tsang collected extensively in Tonkin of Indo-China, particularly along the Chinese border in the extreme north-eastern part of Indo-China. A total of about 2,000 numbers was secured in these Indo-Chinese expeditions, the collector being actually in the field at the time the Japanese occupied the country in 1940. He succeeded in returning to Hong Kong with all of the collections, and the Arnold Arboretum share was fortunately shipped before the fall of Hong Kong. Many of the Lingnan expeditions, especially the more recent ones to Hainan, Kwangsi and Indo-China, were made possible through grants made by the Arnold Arboretum to cover the cost of field operations.

(γ) The herbarium of the University of Nanking was established in 1922, partly through the interest of Dr. E. D. Merrill, who visited Nanking in the summer of that year. Beginning with an expedition in the immediate vicinity of Nanking, operations were gradually extended to other parts of Kiangsu Province by Messrs. A. N. Steward, C. Y. Chiao, K. Ling and others. Collections in Chekiang were made by Steward in 1922, by K. Ling from 1924–31, and by C. Y. Chiao in 1927. In the summers of 1922–4, Steward collected at Lushan, northern Kiangsi, and in the summer of 1932 Steward, N. K. Ip and K. Ling made an extensive collecting trip to Hwangshan and southern Anhwei. Hupeh was explored by Y. Chen in 1926 and H. C. Cheo in 1928, and Honan by Steward in 1925. Beginning in 1930, with the financial co-operation of the New York Botanical Garden and the Arnold Arboretum, several important expeditions were conducted. In 1930, Chiao explored extensively the hilly districts in central and western

parts of Shangtung. In 1931, Steward, Chiao, S. Y. Cheo and H. C. Cheo explored Kweichow Province, proceeding overland by way of Chungking along the main highway from Szechuan to Kweiyang. Many parts of north-eastern Kweichow were visited, including a two-weeks' stay in the finely wooded and isolated Fan Ching Shan. About 1,000 numbers of vascular plants were collected. In 1933, Steward, S. Y. Cheo and H. C. Cheo conducted another expedition to Kwangsi, spending the larger part of the year in the field, operating in the northern as well as the mountainous wilderness of western Kwangsi. In 1935, C. S. Fan and Y. Y. Li explored quite extensively the central and southern part of Hunan, a province also little known botanically. Since 1937, after the University was moved to Chengtu, Szechuan Province, because of the war, explorations in western Szechuan and Sikang have been conducted by C. Y. Chiao and C. S. Fan.

(δ) Besides the herbaria already mentioned, in northern China there are several smaller ones. In the National Normal University of Peiping there is a collection of Hopei plants made by S. C. Lee and C. C. Tao. The herbarium of National Tsinghwa University has a fairly extensive collection of northern Chinese plants, mostly from Hopei. At Tsiuan the herbarium of Shangtung Christian University has a collection of Shangtung plants. In eastern China, Soochow University has a collection of Kiangsu plants. The National Chekiang University has many collections in Chekiang. In southern China, Fukien Christian University has a very extensive collection of Fukien plants made by F. P. Metcalf and his associates from 1923–8. The numbers exceed 15,000, and are the result of many excursions made into different parts of the province. Amoy University has another large collection of Fukien plants of over 5,000 in number, made under the direction of H. H. Chung in 1922–30. In addition to the Botanical Institute of Sun Yatsen University, the Biology Department of the same university is also active in botanical exploration. The explorations carried out by the department were mainly in the Yao Shan region along the Kwangtung-Kwangsi border, made by S. S. Sin, K. Y. Tung and K. K. Wang from 1930–7. Kwangsi University has had many collections of plants made in that province since 1934. In central China, the National Wuhan University has a collection of Hupeh plants. In western China, during recent years, the staffs of both Western China Union University and the National Szechuan University have been active in botanical exploration in Szechuan and Sikang, and the National Yunnan University is assembling collections of Yunnan plants. The North-western College of Agriculture and Forestry sponsored the exploration of Shensi, Kansu and Chinghai by G. Fenzel and Y. Y. Pai in recent years, and has co-operated with the Peiping Academy in establishing the Botanical Survey of north-western China. Fenzel had also in earlier years collected in other localities, such as Kwangtung, Liaoning and Kirin, while making forest surveys.

Western collectors.

The activities of western collectors in China during this period, although less significant in comparison with earlier years, are also important. I shall limit myself, however, to a very brief account, beginning

from the year 1918 only. The many collectors who had prosecuted field work in China in 1918 or earlier, including H. Handel-Mazzetti, K. Schneider, F. N. Meyer, L. H. Bailey, O. Schoh, R. J. Farrer, and W. Purdom, will not be considered further. In 1918, H. Handel-Mazzetti had just finished his well-known expedition in south-western China. In 1919–21, he engaged Wang-Te-Hui, a literary man who had become interested in botanical studies, to collect for him in Hunan, and later in the borderland between Kiangsi and Fukien, chiefly in the region near Ningtu, but he was killed by a tiger while on a collecting trip. Handel-Mazzetti spoke highly of the value of his collection, and lamented his sacrifice to the cause of science.

Probably the most important explorations in China executed by western explorers during this period were those by G. Forrest. His extensive explorations in north-western alpine Yunnan began earlier, but were continued up to 1922. His rich harvest from that famous collecting ground serves as a stimulant to Chinese botanists. Captain F. Kingdon Ward, during his many expeditions up to the present to the Himalayan region, extended his work into Yunnan and Tibet. Another important explorer is J. F. Rock. In 1919–22, under the auspices of the United States Department of Agriculture, and in 1922–4 of the National Geographic Society of the United States, he extensively explored Yunnan both in the north-west along the slopes of the Himalaya and in the south close to the Burma border. In 1924–7, an extensive tour was conducted by him for the Arnold Arboretum to north-western China, particularly in southern Kansu. In 1932–33 he again collected in south-western China for the University of California Botanic Garden.

Harry Smith, of Uppsala University in Sweden, had conducted a number of extensive explorations in Hopei in 1921, Szechuan and Yunnan in 1922, Shansi in 1924, and again in Szechuan and Sikang in 1934. Joseph Hers, a Belgian railway engineer living in China, collected numerous specimens in northern China, chiefly from Honan and Hopei, from 1918 to the early twenties. From Harbin, B. V. Skortzov has consistently collected for many years in northern Manchuria. In the years 1918–23, R. Mell, while making zoological collections in southern China, undertook the preparation of herbarium specimens, largely from Kwangtung. In the years 1919–21, N. H. Cowdry collected many botanical specimens from Hopei and Shangtung. His collection was later deposited at the Peiping Union Medical College, and was extended by B. E. Read, J. C. Liu and others up to 1928. In 1935–6, J. L. Gressitt, of the University of California, interested primarily in collecting zoological material, made extensive collections of botanical material in Hainan, Kwangtung, Fukien and southern Kiangsi.

The work accomplished by the French Roman Catholic missionaries was on a much smaller scale than in earlier years. In Shanghai, Père F. Coutois, of the Musée Heudé, commenced collecting botanical material in Kiangsu and Anhwei in 1903, continuing the work up to his death in 1928 while on a trip to Haichow in northern Kiangsu. At Tientsin, Père E. Licent, of the Musée Hoang-ho Pai-ho, assembled large collections from 1916 to 1937 from various parts of Kansu, Shensi, Shansi, Inner Mongolia, Hopei, Jehol and Kirin.

The United States Department of Agriculture, through many years, has been interested in an agricultural exploration of China, and has sent various staff members to China for the purpose of collecting seeds and living plants, and most of these explorers collected herbarium specimens also. The most important collector of the Department sent to work in China was F. N. Meyer, who commenced his work in China in 1905 and continued it until his death in that country in June 1918. In 1919, J. B. S. Norton was sent to explore southern China, but his programme was cut short on account of illness. In 1919–22, J. F. Rock explored in Yunnan under the auspices of the Department, and was later supported by the National Geographic Society for the years 1922–4. Moreover, he continued to serve for the Department as a collaborator in all his expeditions, conducted later for other institutions. From 1923 up to 1936 F. A. McClure, of Lingnan University at Canton, also served as an agricultural explorer for the Department, investigating economic plants in southern China. In 1924–5, P. H. Dorsett and his son were sent to northern China, where they collected agricultural plants in Hopei, mainly around Peiping, and in the following year the elder Dorsett continued his agricultural exploration in Manchuria. In 1927, W. T. Swingle conducted a trip to Japan and China, primarily for the collection of citrus plants. In 1929–31, P. H. Dorsett and W. F. Morse were sent to China to collect strains and varieties of soya beans as well as forage and fruit plants and ornamentals. They collected in Manchuria, northern and central China. In 1934, a party led by Prof. Nicholas Roerich visited northern China seeking drought-resisting grasses.

This brief review indicates that the past twenty-five years have been a very active and productive period in the botanical exploration of China. Work by western botanists and collectors has been extensive, but the period is marked by the entry of Chinese botanists into the field on a very large scale. The record of the Chinese collectors and botanists has been a meritorious one, for it should be remembered that outside the small herbarium and botanical library in Hong Kong herbaria and botanical libraries were non-existent in China previous to 1916. The achievements of the Chinese systematists has laid a solid foundation for research in other fields of plant science, and in various phases of botany outside taxonomy excellent progress has been made.

It may not be amiss to list here the botanical serials and other media for publication established in China during the period covered by the survey. Here again it is well to keep in mind that previous to 1915 no private, institutional, or government-supported technical serials were established in the entire country. This list, under these circumstances, is distinctly impressive when it is considered that in most of them the contributions are largely the work of Chinese botanists, and, up to about 1915, there was no professionally trained botanist in existence.

'Lingnan Agricultural Review', I (1922) to IV (1927), succeeded by 'Lingnan Science Journal', V (1928) →

'Memoirs of the Science Society of China', I (1923–24) →

' Contributions from the Biological Laboratory of the Science Society of China ', I (1925) →
' Peiping Natural History Bulletin ', I (1926) →,
' Icones Plantarum Sinicarum ', I (1927) →
' Bulletin of the Fan Memorial Institute of Biology ', I (1929) →
' Sinensia '. Contributions from the National Research Institute of Zoology and Botany, I (1929) →
' Icones Filicum Sinicorum ', I (1937) →
' Sunyatsenia ': Journal of the Botanical Institute, Sun Yatsen University, I (1930) → ; and also in the press, vol. I of a Chinese series.
' Hong Kong Naturalist ', I (1930) →
' Contributions from the Institute of Botany, National Academy of Peiping ', I (1931) →
' Bulletin of the Chinese Botanical Society ', I (1935) →
' Chinese Journal of Botany ', I (1936) →
' Iconographia Florae Sinicae ', I (1941) →
' Icones Plantarum Omeiensium ', 1942 →
' Yunnania ', I (in the press).

The Sino-Japanese War, commencing in 1937 and now extended to many parts of China, has had a disastrous effect on botanical progress. Communications with foreign countries have been interrupted, many institutions in areas occupied by Japan have been closed, field-work in occupied areas has largely ceased, and it is feared that important herbaria and collections of botanical literature have been destroyed or, perhaps, actually removed from China. When Chinese institutions were moved to western China, naturally their collections and libraries had to be left behind, but those that have established themselves in temporary quarters still carry on. Naturally, under the stress of a greatly prolonged war, other phases of botany than field exploration and herbarium work had to be developed, particularly in reference to economic plants and their uses. But the experience and knowledge that the Chinese botanists acquired in the twenty years or so preceding the Japanese invasion have been of inestimable value. If we may judge the future by what was accomplished in the past twenty-five years by Chinese botanists, sometimes operating on their own resources, sometimes with cordial support from their colleagues in the United States, Great Britain, and Europe, we may look forward with full confidence, once the present war is finished, to an even more glorious page in the botanical history of China.

Précis of Dr. Hui-Lin Li's paper.

Dr. Hui-Lin Li's paper is an account of the botanical exploration of China during the last twenty-five years, i.e. from 1918, in which he names no fewer than 95 botanists who have been participants in it. As an index to them a list has been prepared and is appended.

There was an elder generation when the survey commenced—a generation including Professor K. K. Tsoong, whose study of the flora of his country dated back to 1908, when his collecting in the province of Kwangtung commenced ; this collecting he extended later to ten other

provinces. Professor S. S. Chien had collected in Kiangsu before 1918, and in Canton from 1916 a small group of American teachers, the chief, Dr. G. W. Groff (then Dean of the College of Agriculture in the Lingnan University) and C. O. Levine (of the same institution) collected, and sent into the field two students—K. P. To and L. S. Kwok. Also in 1916 Dr. E. D. Merrill (then of the Bureau of Science, Manila) made a journey to Canton to collect and, still more, to aid by his advice on the work newly commenced. In 1917 he revisited Canton and collected again.

Dr. Li names other botanists of European nationality at that time and also immediately previously engaged in collecting in China, but none of them with direct interests in the survey, except that Dr. Handel-Mazzetti worked over the collections of Mr. R. C. Ching and induced Mr. Wang-Te-Hui to collect on the borderland of Kiangsi and Fukien. This learned man had the misfortune to be killed by a tiger when out collecting.

About 1916 a realization spread through the teaching staffs in the Chinese educational institutions that, if full advantage was to be taken of the world's vast organization of natural science, a very intimate knowledge could only be obtained by study in research institutions abroad, and, acting on this, several enterprising teachers and some of their promising students travelled to centres of learning in the United States of America and in Britain to take courses and make investigations. Certain of these, who had botany for their particular interest, specialized in taxonomy, and they, after returning to China, initiated surveys of vegetation on their own account and founded and developed herbaria and organized centres of botanical research. At the same time they brought up the new generation, from which have come most of the 35 botanists that Dr. Li names.

The chief of the organizing centres which these repatriated botanists founded, named in the order of foundation, are :—(i) The Biological Laboratory of the Science Society of China, established at Nanking in 1922 as a department within the South-eastern University of Nanking ; (ii) the Fan Memorial Institute of Biology in Peiping, founded in 1928 ; (iii) the Botanical Institute of the Sun Yatsen University in Canton, opened in 1912 ; (iv) the Metropolitan Museum of Natural History, as a department of the Academia Sinica, founded in 1930 ; and (v) the Institute of Botany of the National Academy of Peiping, founded likewise in 1930. There are a dozen and more smaller institutions with botanical collections, but these need not be named in this précis.

It will be apparent that the collecting preceded the founding of the institutions : thus the Biological Laboratory of the Science Society in Nanking had a nucleus seven years old at its founding ; Professor W. Y. Chun had been collecting from 1920, that is nine years, before he was called to be Director of the Botanical Institute of the Sun Yatsen University in Canton ; Dr. H. H. Hu began his collecting in 1920 and was called to be head of the Fan Memorial Institute of Biology in Peiping in 1928.

A disaster befell Professor Chun's first collections, as the building in which they were housed caught fire and they were lost. But collecting was renewed at once.

It was natural that exploration should be most intense in whatever part of China the several institutions were, but everyone has an interest in the botany of China as a whole.

There has been a certain amount of financial aid from Britain and the United States towards the cost of particular collecting expeditions, and some expeditions have been joint, as the Sino-Swedish Expedition to Central Asia in 1930, on which Mr. K. S. Hao served for the National Academy in Peiping, and the Central Asiatic Expedition of the French Government to Sinkiang in 1931, on which Mr. T. N. Liou went.

The Japanese have disturbed the survey seriously. There was a Flora of Chekiang well under way, which has been interrupted. In 1937 they made work at Peiping impossible; whence, when field collecting had to be abandoned, the collectors were moved to Kunming in Yunnan. In the same year the University of Nanking had to be removed and was taken to Chengtu, and the National Research Institute of the Nanking Museum of Natural History was transferred to temporary quarters at Pehpei, in Szechuan. A year earlier, i.e. in 1936, the Institute of Botany of the National Academy of Peiping had been moved to Sian, in order that collecting might be continued beyond interference. In 1938 the work in Canton at the Sun Yatsen University on the floras of Kwangtung and Hainan had to be stopped. The university was moved to Yunnan and the herbarium to Hong Kong. The fate of the latter is unknown.

The collecting has cost the lives of some of the botanists. The misfortune to Mr. Wang-Te-Hui was one. In 1935 Mr. M. Chen died of malaria contracted in southern Yunnan, and in 1937 the same disease and in the same province carried off Mr. S. W. Teng and three of his staff.

An index to the collectors' names.

L. H. Bailey, in various provinces before 1918. F. H. Chen, in Kirin, 1929–31. M. Chen, in Yunnan, 1934–5. Y. Chen, in Hupeh, 1926. W. C. Cheng, in Chekiang, 1924 and 1929; in Szechuan and Sikang, 1930–1; in Anhwei, 1935; in Szechuan, 1936. H. C. Cheo, in Hupeh, 1928; in Kweichow, 1931; in Kwangsi, 1933. C. Y. Cheo, in Kiangsu, 1927; in Shangtung, 1930; in Kweichow, 1931; in Kwangsi, 1933; in Szechuan, 1937 forwards. S. S. Chien, in Kiangsu, 1915; in Anhwei, 1926; in Chekiang, 1926–9. R. C. Ching, in Chekiang, 1924–5; in Fukien and Anhwei, 1925; in Kwangsi and recently in Yunnan. H. F. Chow, in Hopei, 1928. C. S. Chu, in Szechuan, 1935. N. K. Chun, in Kwangtung, 1927. W. Y. Chun, in Hainan, 1920; in Hueph, 1922; in Anhwei, 1924; in Kwangtung and along the borderlands of Kiangsi, Hunan and Kwangsi, 1927; also in Hainan, 1927; in Kwangsi, 1935. H. H. Chung, in Fukien, 1922–30. Z. C. Chung, in Kwangtung and Kwangsi, 1935–6. F. Coutois, in Kiangsi and Anhwei, 1903–28. N. H. Cowdry, in Hopei and Shangtung, 1919–21. P. H. Dorsett, in northern China and Manchuria, 1924–5 and 1929–31. C. S. Fan, in Hunan, 1935; in Szechuan, 1937 forwards. W. P. Fang, on the Szechuan-Kweichow border, 1927; in Szechuan, 1928–30. R. J. Farrer, in Yunnan. K. M. Feng, in Yunnan recently. G. Fenzel, all through the north in forest surveys. G. Forrest, in Yunnan up to

1931. H. Y. Fu, organizing collections of living plants, 1930–7. J. L. Gressitt, in Hainan, Kwangtung, Fukien and Kiangsi, 1935–6. G. W. Groff, in Kwangtung, 1916–17; in Kwangsi, 1919; into Indo-China, 1920. H. Handel-Mazzetti, widely in China up to 1918. K. S. Hao, with Sino-Swedish Expedition to Central Asia in Szechuan and Kansu and then Chinghai and Sinning, and into Mongolia, 1930; in Honan, 1931; in Hopei to 1937. J. Hers, in Honan and Hopei, from 1918 forwards. A. S. Hitchcock, in Tongking and Annam, 1921. T. H. Ho, in Szechuan, 1935; and in Kwangtung. H. C. How, in Kwangtung. W. Y. Hsia, in Shansi, 1929; in Chahar and Suiyang, 1931; in Hopei; in Chinghai, 1936. H. H. Hu, in Chekiang, 1920; in Kiangsi, 1921; in Chekiang, 1926–9. K. H. Ip, in Kiangsu and Anhwei, 1923. Y. L. Keng, in Kiangsu and Chekiang, 1926–9. S. P. Ko, in Kwangtung, 1935–6. H. W. Kung, in Hopei, 1928; in Liaoning and Chahar, 1930; in Kirin, 1931; in Hopei to 1937. L. S. Kwok, in Kwangtung, 1916–17. S. K. Lau, in Kwangtung. S. C. Lee, in Hopei. C. O. Levine, in Kwangtung, 1916–17. C. F. Li, in Hopei, 1928. Y. Y. Li, in Hunan, 1935. H. Y. Liang, in Kwangtung and in Kwangsi, 1935–6. E. Licent, in Kiangsu; Shensi, Inner Mongolia, Hopei, Jehol and Kirin, 1916–37. K. Ling, in Kiangsu, 1923–31. C. M. Liou, in Chinghai, 1936. K. M. Liou, in Honan, 1933; and in Hopei to 1937. T. N. Liou, along the entire coast, i.e. in Shangtung, Kiangsu, Chekiang, Fukien and Kwangtung, 1930; with the French Government's expedition to Sinkiang, 1931; in Chinghai, 1936; in Hopei, 1937. J. C. Liu, in Hopei and Shangtung up to 1928; in Yunnan, 1937 forwards. Y. S. Liu, in Sinkang, 1933–4; in Yunnan from 1937. F. A. McClure, in Hainan, Tongking and Annam, 1921; in Hainan, 1922; in Kwangsi, 1924; in various southern Provinces to 1936. R. Mell, in Kwangtung, 1918–23. E. D. Merrill, in Kwangtung, 1916 and 1917; in Kiangsi, 1922. F. P. Metcalf, in Fukien, 1923–8. F. N. Meyer, in various parts, 1905–13. W. F. Morse, in northern provinces, 1929–31. J. B. S. Norton, in southern provinces, 1919. Y. Y. Pai, in northern provinces. C. Pei, in Anhwei, 1935. W. Purdom, in northern and central provinces before 1918. B. E. Read, in Hopei and Shangtung to 1928. J. F. Rock, in Yunnan, Szechuan and Kansu, 1919–33. N. Roerich, in northern China, 1934. K. Schneider, before 1918. O. Schoh, before 1918. S. S. Sin, on the Kwantung-Kwangsi border, 1930–7. B. V. Skortzov, in northern Manchuria. Harry Smith, in Hopei, 1921; in Szechuan and Yunnan, 1922; in Shansi, 1924; in Szechuan and Sinkang, 1934. A. N. Steward, in Kiangsu and Anhwei, 1922–3; in Honan, 1925; in Kweichow, 1931; in Kwangsi, 1933. W. T. Swingle, widely, studying citrus, 1927. T. Tang, in Hopei, 198; in Shansi, 1929; in Szechuan, 1930. C. C. Tao, in Hopei. S. K. Teng, in Hopei and Chahar, 1936. S. W. Teng, in Kwangtung and Kwangsi, 1936. K. P. To, in Kwangtung, 1916–17; Kwangsi, 1919; into Indo-China and Siam, 1920; in Hainan and into Indo-China, 1921; in Kiangsi, 1924. H. T. Tsai, in Hopei, 1928; in Yunnan, 1932–4. W. T. Tsang, in Hainan, 1922 and 1927; in Kwangsi, 1933–7; in Hainan, 1935; in Tongking, 1937–40. Y. Tsang, in Kwangtung and Hainan, 1927–33; in Kwangsi to 1938. Y. Tsiang, in Kweichow,

1930–1. C. L. Tso, in Kwangtung and Hainan, 1933. K. K. Tsoong, in Kwangtung, 1908; then in Anhwei, Chekiang, Kiangsi, Szechuan, Yunnan, Shansi, Hupeh, Honan, Fukien and Kwangsi. K. Y. Tung, on Kwangtung-Kwangsi border, 1930–7. C. Wang, in Kwangtung. C. W. Wang, in Yunnan, 1935 forwards. F. T. Wang, in Hopei, 1928; in Szechuan, 1930. K. K. Wang, on Kwangtung-Kwangsi border, 1930–7. T. Wang, in Szechuan, 1930. T. P. Wang, in Suiyang, 1934; in Chinghai, 1936. Wang-Te-Hui, on the Kiangsi-Fukien border, 1919. F. Kingdon Ward, in Yunnan and Tibet. T. T. Yü, in Hopei, 1928; in Szechuan and Sinkang, 1931; in Yunnan, 1937 forwards.

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